COCHISE AND MOGOLLON SITES

PINE LAWN VALLEY

WESTERN NEW MEXICO

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FIELDIANA: ANTHROPOLOGY

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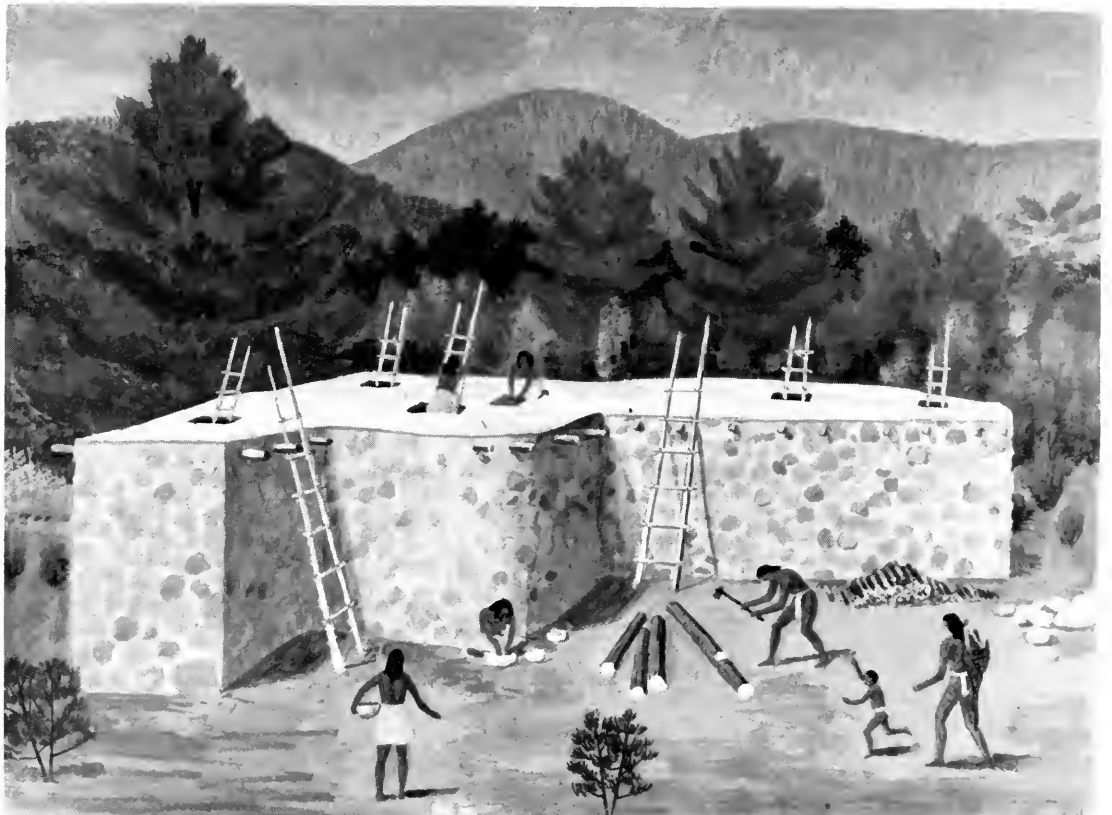

FIG. 1. Restoration drawing of Oak Springs Pueblo, Reserve phase.

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PREFACE

From April to September of 1947, archaeological investigations were conducted in western New Mexico in the Apache National Forest, Catron County. Our nearest town was Reserve, New Mexico, about seven miles to the east. We worked in a valley that we call the Pine Lawn Valley (see map, Fig. 2), which lies between the San Francisco and Saliz Mountains (see Chap. IV).

Our work in the Forest was carried on under a permit issued to Chicago Natural History Museum by the Forest Service, United States Department of Agriculture. From Mr. R. B. Ewing, Forest Supervisor, Apache National Forest, Springerville, Arizona, and from Mr. Ray Swapp, Ranger of the Hood Ranger Station, we received co-operation and friendly assistance, for which we wish to express our gratitude.

The 1947 investigations had two phases, one of which was an extensive archaeological survey and the other, intensive digging at several sites.

The purposes of the survey were two-fold: (1) To hunt for non-pottery sites which would yield information concerning early man in America and the ancestral relationships of the SU site; and (2) to search for pottery sites in order to establish a more complete typological sequence. The survey was conducted by Dr. John B. Rinaldo, who covered more than 100 square miles and discovered more than 100 sites. Mr. E. B. Sayles, of the Arizona State Museum, Tucson, joined Dr. Rinaldo for ten days and directed the search for non-pottery sites.

Stone tools belonging to the Chiricahua stage of the Cochise culture were found in the banks of Wet Leggett Canyon (Twp. 7 S., R. 20 W., Sec. 14, 15, and 23, N.M.P.M. Catron County).

Dr. Ernst Antevs, Globe, Arizona, spent a month in the Pine Lawn Valley and determined the dates of these early stone tools. His complete report on the results of his survey and his researches are contained in this monograph (Chap. IV).

Excavations were carried on at four different sites. The name, phase, and location of each is as follows:

(1) Promontory site, Pine Lawn phase (N.E. ¼ sec. 3, T. 8 S., R. 20 W., N.M.P.M.).

(2) Turkey Foot Ridge, Three Circle phase (S.W. ¼ sec. 34, T. 7 S., R. 20 W., N.M.P.M.).

(3) Twin Bridges site, Three Circle phase (N.W. ¼ sec. 26, T. 7 S., R. 20 W., N.M.P.M.).

(4) Oak Springs Pueblo, Reserve phase (same location as Twin Bridges site).

Reports on these excavations are also included herein.

We wish to thank Mr. Stanley Field and Colonel Clifford C. Gregg, respectively President and Director of Chicago Natural History Museum, and the Board of Trustees, for their continuing interest in and appreciation of our field work.

We take pleasure in thanking the members of the camp staff for their co-operation and assistance: Mr. George I. Quimby, Miss Mary Allee, Mrs. Martha Perry, Mr. Leonard G. Johnson, and Mr. W. T. Egan. Again we wish to acknowledge the invaluable help of Mr. E. B. Sayles, Curator, Arizona State Museum, Tucson, Arizona.

Mrs. Mary Crackel, proprietress of Pine Lawn Camp, continued her generous assistance to us and provided us with electric current, water, and milk.

We wish to thank the men who dug for us: Gregorio and Marcos Jiron, Ben Romero, and Ruben and Willy Serna.

Dr. A. E. Douglass, Director of the Laboratory of Tree-Ring Research, Tucson, Arizona, and his assistants, Dr. Edmund Schulman and Mr. T. L. Smiley, have undertaken to analyze our tree-ring specimens. Dr. Schulman visited camp and took borings of living trees in the Pine Lawn Valley. These borings will greatly aid in the problem of dating our wood, much of which was excavated during the summer.

Miss Shirley Marshall, of the Department of Anthropology, University of Chicago, traced the maps and charts used in this report.

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FIG. 2. Map showing location of Pine Lawn Valley, New Mexico.

I. GENERAL REMARKS

During the summer of 1947, we pursued our study of the archaeology of the Pine Lawn Valley. Specifically, our efforts were directed toward solving several problems that are directly concerned with the origin and development of the Mogollon culture. We sought information that would help us understand the relationship of the Mogollon culture, as manifested in our area, to that culture as it existed in other parts of New Mexico and Arizona.

In our classifications, pottery (when present) is the most important item because it is the most sensitive criterion that we know of at present. Most of the stone implements are also helpful (especially in the Cochise horizon) in setting up our taxonomic groupings, although some tools (polishing stones, hammerstones) are not useful because they are not specialized enough in shape or time. In our area, bone tools and likewise pit-houses are also helpful in our scheme in a limited way, especially when used in conjunction with pottery and stone tools.

Thus it will be understood by the reader that the "Mogollon culture" is an invention of several archaeologists and is used here to describe houses, pottery, and tools that seem to be different in form from those found in ruins called "Anasazi" or "Pueblo." When we speak of the "Pine Lawn phase" we refer to an interval of time (ending about A.D. 500) and to specific pottery types, bone and stone tool types, and house forms, all of which we have deliberately and arbitrarily set up as classifications. From these, it is hoped to reconstruct the history of our region and to humanize our researches. We are not interested merely in presenting measurements or classifications; we hope to go beyond them. For that reason, we separate our observations and data from our conjectures and each section is carefully labeled so that the student will not go astray.

A résumé of the taxonomic entity called the Mogollon culture is perhaps in order. In dealing with this subject, we place the Mimbres phase as a late development of the Mogollon classification.

In 1907, Hough published a report on the antiquities of the upper Gila and Salt River valleys in Arizona and New Mexico. He not only conducted an archaeological reconnaissance over a large area,

but he also did some digging. Near Luna, New Mexico, only seventeen miles distant from Pine Lawn Valley, he discovered several pit-house villages. The pottery was mostly "fragments of coarse brown undecorated pottery" (Alma Plain?) and only a few fragments of "a peculiar creamy white ware with red-brown linear decoration." (Three Circle Red-on-White?) In several places (pp. 9, 25, 26) Hough suggests that the tribes formerly inhabiting the upper Gila-Salt River region "were distinct from the tribes of the neighboring regions and sprang from an original local source," and that the developments in sculptural forms pointed to southern influences. In other words, Hough recognized that the cultures of the upper Gila regions were different from those centering around Gallup and northward from there; and it must be remembered that the earliest sites that he saw we would now probably put in the Three Circle phase, and the latest ones in the Tularosa phase.

Bradfield carried on excavations for several years in Mimbres Valley, and dug pit-houses as well as surface rooms. He felt that a "detailed study of the earliest periods of Mimbres cultural development will reveal interesting facts in the early period of Pre-Pueblo culture in the Southwest not yet thoroughly understood." (Bradfield, 1927, p. 559.) Whether Mr. Bradfield ever changed his mind about the ancestry of the Mimbres culture is not known, as he died before his final report had been completed.

The Cosgroves (1932, p. 113) stated that Mimbres origins were unknown to them, although in the same report Kidder (p. xix) implied that from the point of view of the San Juan nucleus the Mimbres culture was peripheral. Kidder also stated in the same place that the Gila, and perhaps also Chihuahua, must be reckoned with as the theater of a development perhaps quite independent. Kidder's point of view was not unreasonable in 1932 because at that time only late Mogollon-Mimbres sites had been studied. It now seems fairly certain to us that the Mimbres culture is a "mixture" of the Mogollon and Anasazi assemblages.

Gladwin (1934, pp. 221–227) briefly described the "Mogollon branch," which he had named the preceding year. So far as we know, Gladwin was the first to name and mention the Mogollon culture as such.

Haury made the first published report on this subject (1936a, b). Here for the first time the Mogollon culture was set forth as a taxonomic entity that was different from the Anasazi and Hohokam classifications.

Many words both for and against the idea have been poured forth since the date of that publication. Those opposed to a Mogollon entity have rarely had much actual contact with Mogollon sites and materials. Every Mogollon expert with whom we have talked readily admits that Anasazi influences were strong in the Mogollon area after about A.D. 700. After studying our data and materials from four seasons' work in the Pine Lawn Valley, we are convinced that we are not chasing a phantom. It seems evident to all who have worked in the Mogollon area, including Nesbitt (Martin, 1940, p. 10), that Mogollon culture is a valid concept that corresponds to a reality. Enough work has been done now in the Mogollon area to show that we never shall have many traits to work with. The Mogollon culture, as we conceive it, is simple, relatively poor, and has only a few cultural traits: pottery, tools of bone and stone, and houses. If we arrive at any conclusions about the materials in question, we shall have to squeeze them out of the four traits just mentioned. It is possible that later work, in caves especially, may disclose more traits.

Haury named and defined three distinct non-Puebloan phases that were earlier than the Mimbres phase. He asserted that the early stages of the culture called Mogollon were neither Anasazi nor Hohokam (our work in a still earlier phase of the Mogollon culture completely supports Haury's views of 1934); that the separateness of the Mogollon concept had much to recommend it; and that the "mixture" of Anasazi and Hohokam traits about A.D. 900, combined with the original Mogollon traits, produced what is known as the Mimbres phase.

Nesbitt (1938) excavated, in the Pine Lawn Valley, some houses belonging to the San Francisco and Three Circle phases. He now agrees with our hypotheses concerning the Mogollon culture, although at that time (1938) he stated that the Mogollon culture, *as currently known*, did not represent a new basic pattern.

Haury (1940) again attacked the Mogollon problem by excavating a series of houses in the Forestdale Valley, in east-central Arizona. The significance of the Bear Ruin (in the Forestdale Valley) lies in the nature of the cultural traits, which show a blending and hybridizing of Mogollon and Anasazi elements. It seemed to Haury that the Bear Ruin represented a local and marginal aspect of the Mogollon culture and that its individuality was intensified by mixture with the Anasazi culture.

As a result of his studies at the Bear Ruin in the Forestdale Valley, Haury advanced the hypothesis that the Mogollon culture

was an independent entity and that it may have been the underpinning for later and higher cultural groups.

In 1941, Haury dug twenty-three pit-houses in the Bluff site (Haury, 1942), Forestdale Valley, Arizona. The pottery and tools from this site show unmistakable marks of relationship with the SU site (Martin, 1940, 1943; Martin and Rinaldo, 1947) and are classified as Mogollon. Furthermore, this is the first "pure" Mogollon site to be *dated* (early portion of the fourth century A.D.). Interestingly enough, the traits found were more or less what Dr. Haury had guessed would turn up in an early Mogollon site.

The most recent significant information pertaining to the Mogollon problem is presented by Sayles (1945) in a report on excavations in the San Simon Valley. There he found a cultural development that parallels the development in the Mimbres branch in pottery, in architecture, and, to some extent, in stone tools. The pottery and houses of his earliest phase, Penasco (formerly referred to by some archaeologists as "Cave Creek phase"), are similar in many respects to those of the Pine Lawn phase. The Mogollon development as described by Sayles for the San Simon district is complete, whereas in the Mimbres branch (exemplified by Mogollon 1:15, Harris, Starkweather, and SU sites; Haury, 1936a; Nesbitt, 1938; Martin, 1940, 1943; Martin and Rinaldo, 1947) there are some gaps. Sayles can demonstrate a complete taxonomic sequence from earliest Cochise times through to the Encinas phase, which is roughly equivalent to the Mimbres or Reserve phase.

PROBLEMS

When the Mogollon concept was announced a decade ago, there was much controversy over its validity. As now may be seen, there is a growing body of evidence to support the Mogollon hypothesis.

While there are yet many problems to cope with, we now feel that the taxonomic concept of a Mogollon culture is better established. As a result of our four seasons' work in New Mexico, we believe that the argument concerning the separateness of the Mogollon culture is largely an academic one, in view of the large amount of data on hand. Details are lacking, but a few important landmarks have been pointed out, some of which appear in this report; for example, the relationship of the Mogollon culture to the Cochise complex; the simplicity of the earlier phases; the complete sequence of the San Simon branch; the trends in pottery development (which differ from the traditions of the Anasazi and the Hohokam); and the related trends in stone tools and in architecture.

II. ARCHAEOLOGICAL SURVEY IN THE RESERVE AREA

In accordance with the plans of the Chicago Natural History Museum Expedition, Dr. Rinaldo was sent out to New Mexico in April, 1947, to conduct an archaeological survey in the Reserve area with the primary purpose of locating any stage earlier than Pine Lawn phase, and any non-pottery horizon; and the secondary purpose of finding a large series of pottery-bearing sites which would present enough data to permit us to set up a complete local typological sequence. On the basis of Haury's Mimbres Valley excavations for Gila Pueblo farther to the south, and Nesbitt's excavations of the Starkweather Ruin to the east, it had been assumed that the Red-on-Brown sequence would hold in the Pine Lawn Valley between the two localities; nevertheless it seemed absolutely necessary to investigate the local sequence in greater detail because the area lies so close to the consistently occurring Black-on-White sequence to the north and especially because no pottery of the Mogollon Red-on-Brown type had been found on the surface or in the excavations in the Pine Lawn Valley up to that time.

Several earlier archaeological surveys had been conducted in the Reserve area but none of them was intensive enough to fulfill the purposes outlined for the present survey. The earliest archaeological survey in the Reserve area was made by Walter Hough for the Bureau of American Ethnology, which published the report of his findings in 1907 (Bulletin 35). However, this very extensive survey overlapped our own only in the Tularosa River and Apache Creek drainages and did not touch upon the Leggett, Saliz and SU Canyon drainages most intensively surveyed this year; nor did Hough explore the reaches of the San Francisco River from Reserve up to The Box, where the river turns west toward Luna—another area explored this year.

In 1931 Dr. Emil Haury and Russell Hastings, both then associated with Gila Pueblo, visited the major and more accessible sites in the vicinity. Finally, in 1941, Brigham A. Arnold conducted a very intensive archaeological reconnaissance survey of two relatively small areas situated in the Leggett Canyon drainage (Martin,

1943, pp. 252–263). Although these surveys described numerous sites of the Reserve and Tularosa phases and a few of the Pine Lawn phase, there were no sites that might be placed with any probability in the Georgetown or San Francisco phases and very few of the Three Circle phase, thus leaving an unexplained gap in the local sequence.

The area covered most intensively by the present survey extends from the Starkweather Canyon west to the head of Wet Leggett and Lost Springs canyons and south from Luna Mountain down the main Leggett drainage to the junction of Saliz and Leggett canyons. Somewhat less intensively the area down Saliz Canyon to the San Francisco River and the area up the San Francisco River from Reserve to The Box and east to Apache Creek, including the Largo Canyon and Tularosa River drainages, was examined. Finally, such terrain features as cienagas and deep arroyos showing cut banks in the area north to Spur Lake and south to Cliff were examined with a view to finding evidences of early man. Mr. E. B. Sayles of Arizona State Museum and Dr. Ernst Antevs were partners at different times in the search for evidences of early man. What was found of this nature was due to their great knowledge, experience, and assistance. Before the excavation season started, Mr. Ruben M. Serna acted as local guide and assistant, and his intimate knowledge of local roads, trails, springs and terrain was very helpful.

METHOD

The rugged mountainous character of the terrain, the great size of the area to be covered, and the time allotted for the purpose did not permit investigation of the entire area on foot. A light truck was used wherever possible beyond the Pine Lawn Valley. The usual procedure was to drive the truck to a particular known group of ruins, or an area around a spring or cienaga to be explored; then a systematic search was made from there on foot. On discovering a site, we made a collection of pottery and artifacts, and entered on a card the pertinent geographical data (terrain, vegetation, etc.) and archaeological data (dimensions of ruin, probable number of rooms, pottery and artifact types, etc.). When feasible, we made a sketch map of the site on the back of the card. The pottery and artifacts were then put in a sack and tagged with the site number in sequence. At camp the sherds and artifacts were washed, counted and classified and the additional data gained therefrom was entered on the cards, which were then edited and typewritten. These cards are on file at Chicago Natural History Museum.

CLASSIFICATION OF SITES

The sites found were grouped into five classifications: (1) non-pottery sites, (2) sherd areas and pit-house sites yielding only plain ware, (3) combined pueblo and pit-house sites, (4) small pueblo sites, and (5) large pueblo sites.

One non-pottery site yielding stone artifacts only was found by Mr. E. B. Sayles and Dr. Rinaldo early in the season. This was named the Wet Leggett site because of its location in the banks of the Wet Leggett arroyo. This site is described in another section of this report.

The plain ware sites might be classified as sites of the Pine Lawn phase. These sites were both plain ware sherd areas (without house depressions), and sites with noticeable, round, depressed areas that are almost certain to mark the location of pit-houses. The pottery found on such sites was Alma Rough, Alma Plain, and the early variety of San Francisco Red. Three of these sites seemed to be unusual in location and in having stone "walls," and these differences were thought to be possibly significant. They were all located on top of high, steep-sided, flat-topped mesas, one end of which was crossed by three or more "walls" or linear piles of lava boulders. In two cases these "walls" appeared to block off the least accessible end of the mesa, as if they were meant for crude fortifications. One of these sites on a mesa opposite Apache Creek is mentioned by Hough (Site 107, "Wall," p. 74, 1907), although his report describes only one wall and makes no mention of the pottery types to be found there. Another site of this type (the Promontory site), was excavated during the course of the season and the prognosis that it belonged to the Pine Lawn phase proved to be correct. The excavations at this site are described in pages 81 to 101. At least a dozen sites of the Pine Lawn phase yielding only plain wares are known in the Reserve area. They range in size from the large SU site, which was a village of thirty or more houses, to small sherd areas showing but a single noticeable house depression.

The second grouping of sites consisted of those with both pueblo ruins and pit-house depressions. We located eight sites falling in this category. The pueblo ruins on such sites were for the most part small, containing probably less than seven rooms. The pottery types found were Alma Plain, San Francisco Red, Three Circle Neck Corrugated, Reserve Smudged, Reserve Black-on-White, and Three Circle Red-on-White. However, two of these sites gave evidence of a longer time span of occupation by the presence of a

number of Tularosa Black-on-White and Upper Gila Corrugated sherds along with the Three Circle Red-on-White and Three Circle Neck Corrugated sherds. This assemblage of wares indicates a possible time span of occupation from Three Circle phase times to the Tularosa phase. Two pit-houses on one of these sites (Turkey Foot Ridge) were excavated and are described in another section (pp. 102–108).

A third and larger grouping was that of small pueblo ruins. These were characterized by masonry ruins containing from two to seven rooms, and by the following pottery types: Alma Plain, San Francisco Red, Three Circle Neck Corrugated, Incised Corrugated, Reserve Smudged and Reserve Black-on-White. There were no kiva depressions associated with many of these sites. Thirty-four such small ruins were found. With two exceptions, which were sites on which Tularosa Black-on-White and Upper Gila Corrugated pottery was found in some quantity, all of these sites are believed to belong to the Reserve phase. One pueblo of this type (Oak Springs Pueblo) was excavated during the season and is described in this report (pp. 126–129).

A fourth grouping of pottery sites is that of large pueblos containing from eight to twelve rooms. The pottery types characteristically associated with such sites in the Reserve area are as follows: Alma Plain, San Francisco Red, Upper Gila Corrugated, Mimbres Neck Corrugated, Reserve Smudged, Tularosa Black-on-White, Reserve Fillet Rim, Reserve Polychrome, and occasional intrusive Black-on-Red types (Puerco and Wingate Black-on-Red). Frequently large rectangular kiva depressions are associated with such ruins; others are surrounded by walls, grouped around plazas in an orderly fashion, or show other signs of community planning and activity. These are the ruins that were featured in Hough's report and are to be found most frequently along the larger permanent watercourses such as the San Francisco and Tularosa rivers. Those most easily accessible to the main roads and the towns have been badly pitted by pottery hunters. A few small obsidian triangular arrowpoints were found on such sites, as well as some tiny disk beads and an arrowshaft smoother. Such artifacts appear to be characteristic of the later sites.

Fragments of troughed metates with one closed end were found on sites of all categories. Rectangular manos were found on both pueblo and pit-house sites. Basin-type metates were found only on sites of the Pine Lawn phase.

SUMMARY

During the spring of 1947 an archaeological survey was conducted in an area within a fifteen-mile radius of Reserve, New Mexico, in order to find a non-pottery site yielding evidence of early man in America and to fill in gaps in the local sequence of pottery phases not revealed by the previous surveys and excavations in the Pine Lawn Valley.

A non-pottery site was discovered that shows evidence of early man, and cave sites of some promise were also discovered. The sixty-seven pottery sites visited and described fall into four categories representative of different culture phases: (1) Plain ware sherd areas and pit-house sites probably of the Pine Lawn phase, represented by twelve sites; (2) combined pit-house and pueblo sites yielding Three Circle Red-on-White and Reserve Black-on-White pottery, probably of the Three Circle and Reserve phases, represented by eight sites; (3) small pueblos of less than seven rooms containing Reserve Black-on-White pottery and probably of the Reserve phase, represented by thirty-four sites; (4) large pueblos with more than seven rooms and a rectangular kiva and with Tularosa Black-on-White pottery, of the Tularosa phase, represented by thirteen sites. No Mogollon Red-on-Brown pottery was found on the surface in the Pine Lawn Valley proper although a large pit-house village of the "small pueblo and pit-house" grouping, partially excavated during the season, revealed some Mogollon Red-on-Brown pottery in the houses. This site appears to give promise that the Red-on-Brown sequence found at Mogollon 1:15 and Starkweather will hold for the Pine Lawn Valley as well.

III. EXCAVATIONS

BY

GEORGE I. QUIMBY

During the 1947 field season Chicago Natural History Museum's archaeological expedition to the Southwest undertook excavations at five sites in Pine Lawn Valley of western New Mexico. Labor, obtained locally, consisted of five young men of Spanish-American tradition, who rendered excellent service. Tools and techniques used in the excavation of these sites were so similar to those described by Braidwood (Martin, 1943) that they need not be described here. In the following pages, the excavations are described briefly by site.

WET LEGGETT SITE

The Wet Leggett site presented a special problem of excavation that never was solved. The question was where to excavate.

Chiricahua (Cochise) type artifacts exposed by erosion were scattered along the banks of Wet Leggett arroyo for about two miles. In many instances the artifacts were *in situ* and only partly exposed by erosion. These artifacts were unevenly distributed throughout the upper 100 cm. of a gray alluvial deposit that was extremely hard and compact. On top of the gray alluvial deposit was another alluvial stratum of ashy, dark-gray silt varying in thickness from a few centimeters to about one meter, although in some places erosion had completely removed this stratum.

Preliminary examinations of upper Wet Leggett arroyo disclosed two concentrations of artifacts *in situ*. These areas were designated Locus A and Locus B (fig. 4) and excavations were undertaken at both places.

At Locus A it was planned to excavate in terms of ten-centimeter levels within two-meter squares. The grid system, however, was abandoned when it was discovered that location stakes could not be driven into the hard gray silt. It was then decided to explore Locus A by means of test trenches in which levels and positions of artifacts would be taken by instrument. Accordingly several trenches were begun, but even with the use of heavy picks the

progress of the excavation was extremely slow. In some instances the pick merely bounced off the hard silt; in others, the point of the pick penetrated the gray silt only a few centimeters. At best the silt was picked out in small clods that were then broken up.

The difficulty of excavation and the absence of artifacts led to the abandonment of Locus A after two days of digging. Attention was then directed to Locus B, where the same procedure was repeated. In addition, tongues of land at the junction of the main and tributary arroyos were cut down. Again no artifacts were forthcoming, and the excavation was slow and very difficult. With mining equipment and techniques it might have been possible to undertake exploratory trenching in a satisfactory manner, but such a thing was out of the question. Therefore, the archaeological investigation of Wet Leggett was carried out in the following way:

Artifacts exposed by erosion but still *in situ* in the steep walls of the arroyo were photographed. Then these artifacts were removed, with the aid of a geologist's hand-pick. As each specimen was removed, a metal surveying stake was driven into the hard gray silt to mark the position of the artifact. A catalogue description of the artifact was written in pencil on a paper tag, which was then fastened to each location stake. Then the location and elevation of each artifact was determined by instrument and plotted on the traverse map of the arroyo. No hearths, house structures or other evidence of actual dwelling area was found in the course of these investigations.

At both Locus A and Locus B faces were cut by mattock in the banks of the arroyo so that clear profiles would be available for study by Dr. Ernst Antevs. Dr. Antevs also examined the location of each specimen found *in situ* and made profiles of all significant strata in the vicinity of a given artifact, usually before the artifact was replaced by a marker stake.

The conditions prevailing at the Wet Leggett site call for a long-term plan of investigation. It was decided, therefore, to examine the site during each future field season and to collect and record the locations of additional specimens exposed by erosion. If, at some future time, hearths, dwellings, or other evidence of specific, localized habitation is found, excavation of that locus will be undertaken despite the hardness of the silt.

PROMONTORY SITE

The Promontory site, although confined to the top of a mesa, was extensive and contained numerous shallow depressions mani-

festing former pit-houses. Pottery sherds and stone artifacts collected in abundance from the surface of the site were types characteristic of the Pine Lawn phase. This phase was well known from the exhaustive investigation of the nearby SU site in previous years. Consequently, it did not seem advisable to excavate completely another large site of the Pine Lawn phase. It did, however, seem worth while to sample the Promontory site in an attempt to find out: (1) if the entire occupancy of the site were in the Pine Lawn period; (2) if occupancy of a somewhat inaccessible mesa had any cultural significance discoverable by archaeological techniques; and (3) if there were observable temporal and spatial variations within the Pine Lawn phase.

With these objectives in mind five pit-house depressions were selected for excavation. This selection was made in an attempt to obtain a reasonably adequate sampling of the site. The distribution of the excavated houses (fig. 21, map of Promontory site) shows that most of the site was tested in terms of this selection.

It seemed preferable, as far as possible, to test the site by means of complete excavation of a few selected pit-houses rather than by indiscriminate test trenches in a large number of pit-houses. The data thus obtained by complete excavation would be more comparable with data obtained in previous seasons as well as with data from other sites excavated during the current season. By maintaining the quantitative and qualitative standard already established, all of the data—past, present, and future—could be more easily manipulated in the laboratory analyses and interpretations.

The method of excavation was the same as that used previously at the SU site. This method has been described by Braidwood (Martin, 1943); consequently it will only be outlined here.

First, a particular pit-house is chosen for excavation. The pit-house is manifested superficially by a shallow, saucer-shaped depression. This circular depression is then bisected by a narrow trench through the fill of the pit-house. The fill consists of washed-in soils and cultural detritus, and because it is darker in color and looser in texture it can be distinguished from the wall and floor of the pit-house. Thus the bisecting or cross trench is cut through this fill so that it extends from one wall to the other and from the surface of the ground to the floor in such a way that it does not damage the walls and original floor of the house.

After the cross trench has been completed another trench is cut around the periphery of the house. The peripheral trench follows

the original wall of the house and extends from the surface of the ground to the original floor. With the completion of the peripheral or wall trench the total trench configuration takes the form of a bisected circle.

The next step in the excavation of the pit-house is to remove the two roughly semicircular blocks of fill isolated by the trenches. All of this fill is removed to a depth of about 10 cm. above the original floor of the house. The remaining 10 cm. of fill is considered the occupation floor and is removed separately.

When the original floor of the house is reached it is cleaned of all traces of fill; pits and postholes are also stripped of their deposits of fill.

Finally, the fill is removed from the entrance passage and the pit-house is completely excavated.

The recovery of the cultural materials goes hand in hand with the excavation of the pit-house. Before the excavation begins, all cultural débris is removed from the surface. Then, as the excavation proceeds, the cultural refuse is collected by unit of excavation. For instance, the materials recovered from the cross trench are kept separate from those found in the wall trench, and the cultural remains found in the semicircular blocks of fill are collected separately from those found in the floor level. Thus each unit of excavation is a separate provenience.

After a pit-house has been excavated completely it is photographed from a portable tower designed for that purpose. In addition the pit-house is carefully surveyed and maps are drawn of both the ground plan and the profile.

After the mapping and photographing have been completed the pit-house excavation is back-filled. This is done to prevent erosion and to eliminate danger to cattle.

The method of excavation outlined above was used on four of the five houses examined at the Promontory site. One pit-house was not completely excavated, partly because of its unusually large size and partly because of the complication produced by a big juniper tree near the middle of the house. However, considerable information about this house was obtained from the cross trench, the wall trench, and the entrance passage.

TWIN BRIDGES SITE

The Twin Bridges site was a small pit-house village located on the top of a gently sloping, narrow ridge (fig. 36). The preliminary

survey of the site revealed several very shallow circular depressions and a few sherds of Mogollon plain wares only, suggesting that the site might belong to the early part of the Pine Lawn phase or might, perhaps, be even earlier. However, the actual excavation produced decorated pottery and other traits which revealed that the site belonged to the later Three Circle phase of Mogollon.

This site consisted of four pit-houses, two of them square, one nearly square, and one of irregular outline. The method of excavation was the same as that already described for the Promontory site with the exception, of course, that the peripheral or wall trench in a square pit-house was itself square, and the blocks of fill isolated by the cross trench and the wall trench were rectangular instead of semicircular as in a round pit-house.

OAK SPRINGS SITE

The pueblo ruin that constituted the Oak Springs site was located on the valley floor above Oak Springs arroyo. Before excavation, this ruin was manifested by a low, ovoid mound of lichen-covered boulders through which grew a large western pine tree. It was obvious that a considerable portion of the pueblo must have been damaged by the growth of the pine tree, but it also looked as though the northwestern part of the ruin were undamaged. Accordingly excavation was begun in the undisturbed portion of the pueblo.

The first step in this excavation was the removal of the superficial boulders. When these had been removed, it was possible to ascertain in a general way the trend of the walls. Then a central pit was begun in the fill of what was believed to be a room and the sides of the pit were expanded until the walls of the room were reached. Then the excavation was continued downward until the floor was encountered at the base of the walls. Finally the stone walls and the dirt floor were cleaned by brushing. In this manner all of the fill was removed from one room.

The fill removed from the room consisted of black, silty humus and numerous boulders from the fallen, upper walls of the pueblo. These boulders in the fill made the digging rather difficult.

Pottery sherds and other artifacts were relatively scarce and culturally indicative of only one occupancy, the Reserve phase of Anasazi.

Because of the scarcity of artifacts and their cultural uniformity and because of the difficulty of digging it was decided not to excavate the remaining rooms in terms of levels, but to continue the excava-

tion exactly as it had been done in the first room. Should the need arise at any time, the excavation method could be changed to meet the new circumstances.

With one room, A, completely excavated it was easy to locate two adjoining rooms, B and C (fig. 45), and then still another room, F. These three rooms were excavated by the same method as room A.

The four rooms, A, B, C, and F, formed one line of an L-shaped pueblo (fig. 45). The rooms in the remaining line had been badly disturbed by the growth of a large pine tree and several junipers. Despite the disturbance, two more rooms, D and E, were excavated; the remaining room could be ascertained only by external trenching.

The floors of the rooms were without pits or features of any kind with one exception. There were a number of small rocks scattered over the floor of room B and in the north end of the room there were three burials. These burials either were on the floor or were in pits that had been dug into the subsequent fill of the room.

The floors were of brown gumbo and were level with the base of the walls. After the mapping and photographing of the pueblo had been completed, the floors were trenched to make certain that no features had been overlooked and that the floor rested on sterile gumbo.

An outside trench along the west walls of Rooms A, B, C, and F showed conclusively that the pueblo originally had been partly subterranean. The soil profile in this trench, taken from the present ground surface to the base of the pueblo wall, showed the following: the top stratum of humus, 15 to 20 cm. thick, contained occasional sherds. Beneath this was a thin stratum of sterile humus about 15 cm. thick. Under the humus was sterile brown gumbo. The base of the pueblo walls and the floors of corresponding rooms were from 20 to 40 cm. beneath the surface of this sterile, compact gumbo. Consequently it seemed certain that the pueblo had been built partly underground.

An extensive network of test trenches was dug east of the pueblo. In these trenches the sterile, brown gumbo was encountered at a depth of 15 cm. or less. The humus above the gumbo contained a few nondescript artifacts and numerous pottery sherds of Reserve phase types.

The bank of Oak Springs arroyo, the top of which was 3 meters north of the pueblo, was liberally sprinkled with sherds that had washed down from above. Any dump or midden over the bank of the arroyo had been destroyed by erosion.

No evidence of a kiva was found, although a determined effort was made to find one in the vicinity of the pueblo.

With the completion of the excavations the pueblo was photographed, surveyed, and mapped. Then the rooms and trenches were back-filled.

TURKEY FOOT SITE

The Turkey Foot site was on the narrow crest of a steep, undulating ridge shaped somewhat like a turkey's foot. Numerous saucer-shaped depressions indicated the presence of former pit-houses. Surface collections obtained in the preliminary examination of this site suggested occupancy by Mogollon people of the Three Circle period. It is interesting to note that the square Three Circle pit-houses are manifested by the same kind of saucer-shaped depressions that appear with the earlier circular pit-houses.

The Three Circle period or phase was relatively unknown in the Pine Lawn Valley. Although a small Three Circle village (Twin Bridges site) had been excavated earlier in the season, it seemed desirable to obtain additional information. Moreover, there was the possibility, or perhaps hope, of locating some Georgetown or San Francisco houses to help bridge the gap between Pine Lawn and Three Circle. Also, because of the lateness of the season, there was time to excavate only one or two pit-houses. Taking all of these factors into consideration, it seemed most fruitful to spend the remaining time in excavating pit-houses at the Turkey Foot site.

The method of excavation was much the same as that of the square pit-houses at the Twin Bridges site. However, while digging the cross trench and the square wall trench of Pit-house A, some sherds were found that possibly were indicative of periods both earlier and later than Three Circle. Consequently, it was decided to dig the remaining blocks of fill by levels to see if any stratigraphy could be obtained from the humus and cultural materials washed into the house after its abandonment. The results obtained by stratigraphic digging of a secondary deposit did not warrant the extra time and effort expended; consequently, the second pit-house examined was excavated in the customary way. This, however, entailed keeping separate the top levels, main body of fill, and floor levels in the two rectangular blocks isolated by the cross trench and the square wall trench.

After excavation had been completed these pit-houses were photographed and mapped. Although there had been time to excavate only two of the numerous pit-houses of the Turkey Foot

site, considerable information had been obtained, and it was planned to continue the excavation of this site at the earliest opportunity.

BACK-FILLING OF THE EXCAVATIONS

To prevent erosion and to protect range cattle from accidents, it was necessary to back-fill all of the excavations. In previous seasons the back-filling was undertaken with the aid of a horse-drawn scraper. This time, however, a small garden tractor with plow and scraper attachments was used with considerable success, with one exception. The exception was the Promontory site, where the back-filling was done by hand because it was impossible to get the tractor to the top of the mesa.

IV. AGE OF COCHISE ARTIFACTS ON THE WET LEGGETT

PLACE AND MODE OF OCCURRENCE OF THE ARTIFACTS

The Wet Leggett site is situated in west-central New Mexico at the intersection of 33° 42′ N. Lat. and 108° 53′ W. Long., eight miles west of Reserve and three miles northwest of Pine Lawn (Fig. 3). It is located in a small valley within the broad Pine Lawn Valley. It lies below the Wet Leggett spring that issues 25 feet above the foot of the San Francisco Mountains, a spring that makes the Wet Leggett into a tiny permanent brooklet for a stretch of 2.2 miles. The site extends between points one-third mile and one mile below the spring (Fig. 4). The main occurrences, Loci A and B, are in the upper part of the site area. The elevation ranges from 6,400 to 6,700 feet. The down-valley slope is 6 per cent. One metate was found 2.5 miles below the spring (profile K).

After being lost or discarded at camp sites on the brooklet, the artifacts were embedded in gravel and silt. They have become exposed by modern gully erosion and are found in the arroyo walls.

GEOMORPHOLOGY

The geography and topography of the Pine Lawn region are shown on the Reserve Quadrangle of the United States Geological Survey and on the Forest Service map of the Apache National Forest.

The Pine Lawn Valley is from three to four miles wide and some ten miles long, and extends in a southwest-northeasterly direction between the San Francisco and the Saliz mountains, which are 8,000 to 9,000 and 7,000 to 7,500 feet high, respectively. The valley ranges from 6,000 to 7,000 feet in elevation, has a midway divide at about 6,350 feet, and is drained to the San Francisco River by small intermittent streams that flow through deep and narrow canyons at both ends.

The geology does not seem to have been studied, but judging from contiguous areas, namely, the Blue River region (Darton,

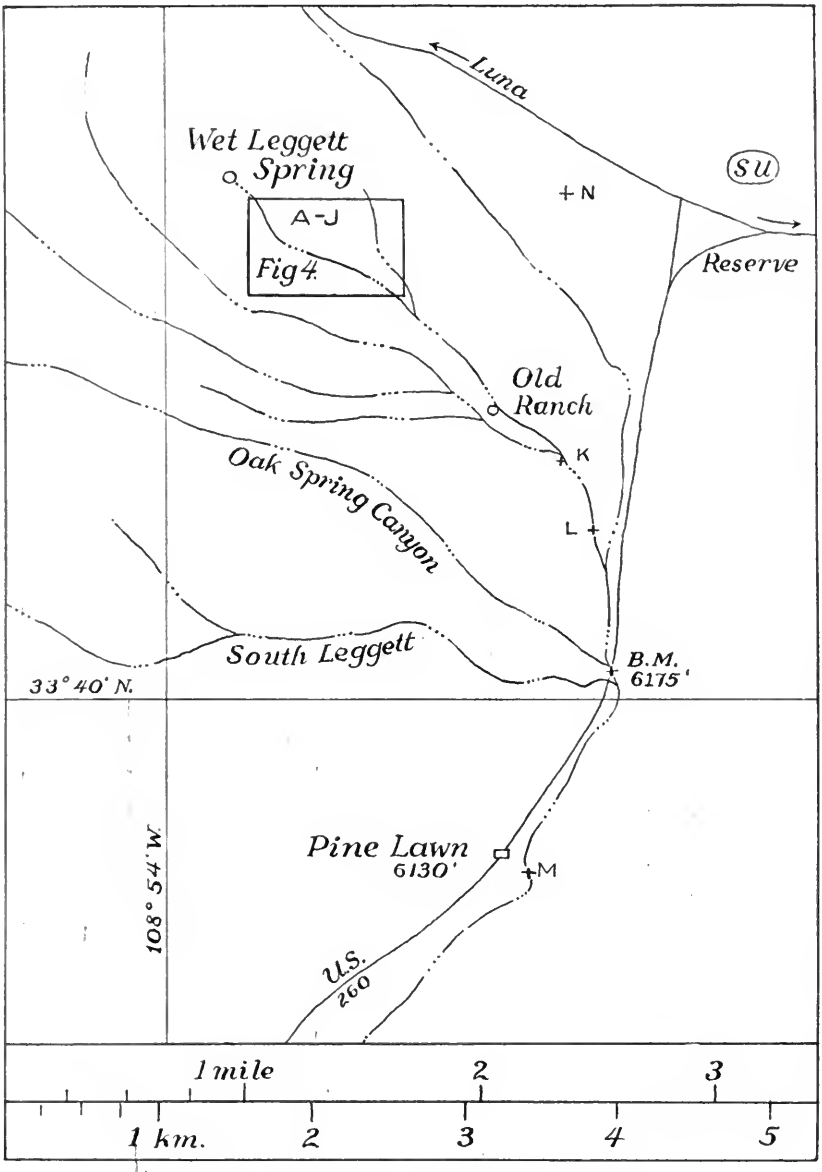


FIG. 3. Sketch of Pine Lawn region.

1925, p. 261), the Mogollon Mountains (Ferguson, 1921, p. 174), and the western San Augustin Plains district (Powers, 1941, pp. 209–211), the bedrocks probably consist of Tertiary igneous and sedimentary rocks. Road cuts and erosion bluffs expose siltstones, sandstones, and conglomerates. Terraces and mesas are capped by

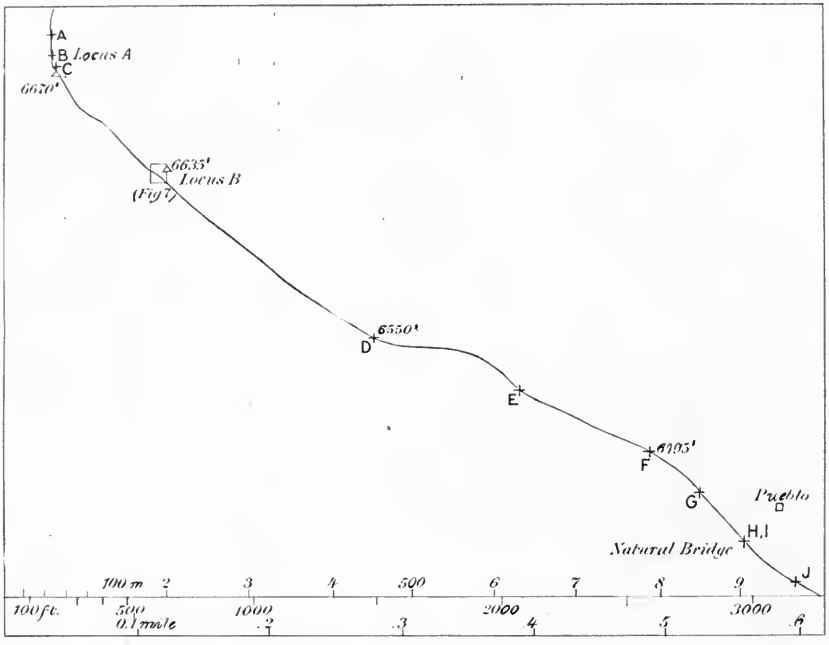


FIG. 4. Locations of sites and profiles on the Wet Leggett. Locus A is one-third mile and Natural Bridge one mile below Wet Leggett spring. Location of this area is shown in Figure 3.

basalt beds. The stone artifacts left by the Indians consist of granite, trachyte, tuff, limestone, sandstone, quartzite, flint, etc.

The young valley deposits range from clay to bouldery gravel and their observed thickness varies from a few feet to more than 25 feet. When thoroughly dry, some beds are firmly cemented.

The Pine Lawn Valley lies on the transition between the Colorado plateau and the Basin-and-Range geomorphic provinces. Thus Fenneman (1931, map, pp. 274–276, 326–328, 380–382, 389) tentatively placed the boundary between the two provinces on 33° 40′ N. Lat., at the Arizona–New Mexico state line, and at the base of the San Francisco, Dillon, Apache, Mangas, and Horse mountains, while Lobeck (1939, p. 528; with Hinds, 1943, pp. 141, 189) included

FIG. 5. Panoramic view of Wet Leggett, showing course of arroyo; looking east.

in the plateau large additional lobes of mountainous land to the west and to the east of the San Francisco River as well as the upper reaches of this stream and its tributaries down to a point that cannot be exactly determined from his small-scale map. Because of the approximately horizontal rocks and the deep and narrow canyons, the Pine Lawn Valley as well as the Saliz and Brushy mountains should probably be included in the plateau province.

MODERN CLIMATE

The climatic data of the greater Reserve region are summarized in "Climatological Data" (U. S. Weather Bureau, Bull. W, 1930, sec. 29), in "Climate and Man" (U. S. Department of Agriculture Yearbook, 1941, pp. 761–772, 1011–24), and in H. V. Smith, "The Climate of Arizona" (University of Arizona Agricultural Experiment Station, Bull. 197, 1945).

There are no temperature records for the Pine Lawn Valley or the immediate vicinity, but the significant temperatures have been calculated. To obtain them the temperatures for Alpine in Arizona and for Luna, Alma, and Cliff in New Mexico were reduced to sea level by adding 0.22° F. for every 100 feet of altitude above sea level to the January values, and 0.36° per 100 feet to the summer values (Landsberg, 1941, p. 120). Then the sea level temperatures at Pine Lawn were interpolated and the probable temperatures there calculated by subtracting the temperature reductions for 6,130 feet elevation.

The calculated basic temperatures for Pine Lawn are given in Table 1. The average temperatures for January, July, and the year are 32°, 68°, and 49° F., respectively. The mean annual range, or the difference between the average temperature of the warmest and the coldest month, is 36°. The average daily temperature variation ranges between nearly 34° in August and 44° in June.

The winters (December, January, February) have on the average cold nights and cool to mild days, but, judging from the absolute maxima and minima for Luna and Alma, temperatures of −20° and +80° can be expected, this being the season of the greatest variability of temperature.[1]

The summers (June, July, August) have a mean temperature of 66° F., but with the large daily temperature variations the nights are mostly cool, the days warm to hot. More significant therefore

[1] Temperature phases: Frigid temperatures, below 0° F.; cold, 0°–32°; cool, 32°–50°; mild, 50°–68°; warm, 68°–80°; hot, above 80°.

TABLE 1.—TEMPERATURE AND GROWING SEASON

Station	Altitude in feet	Average temperature in degrees Fahrenheit										Killing frost (average dates)		Number of days in growing season
		January		June		July		August		Annual	Ann. range	Last in spring	First in fall	
		Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.					
Alpine	8,000	45	8	78	37	77	44	75	43	44	34	June 24	Sept. 10	78
Luna	7,050	46	11	82	37	82	47	79	45	46	36	June 12	Sept. 20	100
Alma	4,800	55	21	91	49	91	57	89	56	55	36	Apr. 29	Oct. 17	171
Cliff	4,470	57	25	94	53	93	61	92	61	58	36	Apr. 28	Oct. 16	171
Pine Lawn	6,130	49	15	86	42	85	51	83	49	49	36	June 1	Sept. 30	120
Calculated		32		64		68		66						

TABLE 2.—PRECIPITATION IN INCHES

Station	Altitude in feet	J	F	M	A	M	J	J	A	S	O	N	D	Annual	Snowfall
Alpine	8,000	1.4	2.0	1.7	1.1	0.7	0.8	4.1	3.6	2.6	1.8	1.4	1.8	22.8	66
Jewett	7,400	0.9	1.0	1.0	0.9	0.7	0.6	2.6	3.3	2.2	0.9	0.6	0.9	15.4	45
Luna	7,050	1.0	1.1	1.0	0.6	0.6	0.7	3.0	2.9	1.8	1.3	1.0	1.2	16.3	43
Hood	5,838	0.8	1.0	1.2	0.9	0.6	0.7	2.4	2.4	1.7	0.8	0.9	0.9	14.3	27
Blue	5,693	1.4	1.4	1.4	0.9	0.5	0.7	4.1	3.3	1.9	1.6	1.3	1.5	19.9	28
Alma	4,800	0.9	0.9	1.1	0.6	0.5	0.7	2.6	2.5	1.6	1.3	1.1	1.1	14.8	7
Cliff	4,470	0.9	1.1	0.7	0.6	0.3	0.5	2.9	2.6	1.7	0.9	0.9	1.2	14.4	7

are the average summer maximum of 85°, the average summer minimum of 47°, and the averages of these figures and of the summer mean of 66°, that is, the mean summer day temperature of 76° and the mean night temperature of 57°. Temperatures near or below freezing, and about 100°, can be expected during all parts of the summer.

Perhaps the most important temperature feature is the amount of the daily range, which averages 44° in June and about 34° in July, August, and January, and thus is one of the largest measured in the Southwest (cf. Kincer, 1928, p. 25; Smith, 1945, p. 68; Visher, 1946, p. 594). This extraordinary difference between the day maximum and the night minimum is mainly a consequence of the exceptionally dry air and clear sky, which let through high percentages of the solar radiation by day and of the outgoing earth radiation by night. It may be partly a result of low-altitude temperature inversions, that is, nightly formation close to the earth of a layer of air colder than the layers somewhat above the ground. Thus the radiation cooling by night may be increased by downflow of chilled heavy air from hills and plateaus into the valleys (Trewartha, 1943, pp. 29–31, 45–46), and the temperature maximum by day may be raised because the heating is confined to the thin air layer below the inversion level, which acts as a glass sheet and prevents the air from ascending and mixing (Haurwitz and Austin, 1944, p. 34).

The growing season is the time between the last killing frost in the spring and the first in the fall, and these generally occur with a minimum shelter temperature above 32° F. and sometimes as high as 40° (Conrad, 1944, p. 95). Because the length of this season varies considerably with local conditions, that at Pine Lawn can only be roughly estimated to last for about 120 days, or from the first of June to the end of September. It matches the growing season in northern New England and in northern Minnesota ("Climate and Man," U. S. Department of Agriculture Yearbook, 1941, p. 746).

The precipitation records at some stations in the region surrounding the Pine Lawn Valley are shown in Table 2. By interpolations from these data the average annual rainfall at Pine Lawn has been determined at 15.5 to 16 inches, or slightly less than at Luna and 1.5 inches more than at Hood Ranger Station, a mile west of Reserve. The rainfall regimen is characterized by a dry season from April to June, a marked rainy season from July to September, a faint fall minimum, and a faint winter maximum. Eight inches, or

50 per cent of the precipitation, fall during the growing season, from June to September. Somewhat over 7 inches fall from July to September, leaving 9 inches for the remaining nine months. About one-third of the annual amount comes in the winter half-year, from November to April, two-thirds from April to October. The average annual snowfall is some 30 inches.

The 20 per cent heavier precipitation at Blue, fourteen miles west-southwest of Pine Lawn, shows that the Pine Lawn Valley lies in the rain shadow of the intervening mountains. Hood Ranger Station, located in the additional rain shadow of the Saliz Mountains, actually receives less summer precipitation than does Cliff, which is 1,368 feet lower.

Summer rains occur mostly as local showers accompanied by thunder and lightning. Most of them are probably caused by forced rise of moist air over hills and mountains. Winter precipitation results mainly from migratory cyclones coming from the Pacific off southern California.

With the exception of the San Francisco River and of short stretches below springs, the streams of the Pine Lawn Valley seem to flow only during periods of melting snow and heavy rains. In canyons and near the foot of the high San Francisco Mountains west and northwest of Pine Lawn seven springs are shown on the Forest Service map. During the dry July of 1947 the Wet Leggett spring, issuing just above the mountain foot, flowed uninterruptedly. At present its flow is artificially diverted just below the spring, but it re-enters the main arroyo one and one-quarter miles down the valley. The sediments in the small Wet Leggett Valley must be practically impervious, for a surprisingly large portion of the tiny flow passed the lower end of the valley at the abandoned old ranch, 2.2 miles below the spring, then sank into the stream bed. Below this point the bed was dry.

In Thornthwaite's classification (1948, Pl. 1) the climate is semi-arid, on the border of dry subhumid, and microthermal, and there is little or no water surplus in any season.

In comparison to Chicago, Pine Lawn has 6° higher temperature in January, 6° lower temperature in July, the same annual temperature, 12° smaller annual range, and more than twice as large daily range. Pine Lawn has one-half as much precipitation as Chicago, and the rainfall is decidedly more concentrated in the period from July to September. The growing season is 120 days as against 196 in Chicago. The most distinctive differences between the Pine Lawn climate and the Chicago climate are associated with

the year round moisture deficiency and with the dry air and the clear sky, which promote relatively cold nights and relatively warm days, a large daily temperature range, throughout the year, and which cause frost late in spring and early in fall, and a short growing season.

In regard to dry-farming, the night temperature and the ground moisture in May-June, and the time of onset of the summer rains are particularly important. The average conditions are rather unfavorable, which means that the actual conditions often are disastrous. Each factor or a combination of them can be decisive. Killing frosts may occur during any part of the summer, and chilly nights without frost are injurious, for instance, to corn. The ground moisture may be low at the arrival of spring, precipitation from April to June may be negligible, and the summer rains may be delayed. As a consequence, the growing season, dependent on adequate soil moisture and precipitation as well as on frostfree temperature, may be too short. On the other hand, some years are much better than the average figures and dates suggest.

It therefore deserves mention that maize is grown in Pine Lawn Valley at 6,150 to 6,350 feet elevation. During favorable summers a dwarf corn even matures at Luna at 7,050 feet altitude; but here maize has about reached its climatic limit, for it does not ripen every year, nor is it raised at all at Alpine at 8,000 feet. Similarly its limit is approached at Jewett Ranger Station, located twenty miles north-northeast of Reserve at about 7,400 feet, where mediocre corn crops are obtained during summers with a long frostless season and available moisture.[1] There are no temperature data for Jewett Ranger Station, but at Luna the average temperature of June, July, and August is 62° F., the mean night temperature of the same months is 52.5°, and the growing season is 100 days. At Alpine the corresponding figures are 59° and 50° and 78 days. Thus the regional lower limits of temperature and of length of season for maize are determined within narrow limits. These limits may be near the absolute ones, for "practically no corn is grown where the mean summer temperature is less than 66° F., or where the average night temperature during the three summer months falls below 55°. . . . The region of greatest production [of corn] in the United States has a mean summer temperature of 70° to 80°, a mean night temperature exceeding 58°, and a frostless season of over 140 days." (Jenkins, 1941, p. 310.)

[1] The data on corn have kindly been supplied by Forest Supervisor R. B. Ewing and Forest Rangers Dean M. Earl and Robert L. Diggs.

VEGETATION AND FAUNA

The dominant tree in the Pine Lawn Valley is the western yellow pine (ponderosa pine), which in Arizona forms pure stands in the altitude zone of 6,000 to 7,500 feet (Nichol, 1937, pp. 183, 187), and whose lower limit is determined by deficient moisture (Pearson, 1931, p. 115). Since the yellow pine at Pine Lawn grows under an average precipitation of 16 inches a year and of 8.5 inches from May to September, while the normal minimum requirements are 20 and 9 inches, respectively, there must be some conditions tending to lower the moisture demands (Pearson, 1931, pp. 124, 120). One such factor may be few and light winds. At the Wet Leggett site, at about 6,600 feet elevation, there is a mixed forest in which yellow pine and juniper predominate. Native food plants of the region include oaks, currants, gooseberries, and many grasses. In Hart Merriam's life zone classification the Pine Lawn Valley should be included in the Transition zone, the zone of the open yellow pine forest, rather than, as is done by Vernon Bailey (1913, pp. 11, 25, 41; Pl. 1), in the Upper Sonoran, the zone of pinyon pine and juniper.

The most important food animals of the region are mule deer, white-tailed deer, black bear, rabbits, tree squirrels, ground squirrels, chipmunks, prairie dogs, wood rats, turkeys, quails, and doves (Vernon Bailey, 1913, p. 43, and 1931; Ligon, 1927; Naturalist's Guide, pp. 567, 570).

BEDS AND STRATIFICATION

The artifacts are found in the walls of modern gullies or arroyos, cut by the Wet Leggett and its tributaries. The depth of the gullies in the site area ranges from 2.5 to 7 meters and is mostly about 4.6 meters. The width of the arroyos is usually greater than their depth, the banks being steep to perpendicular.

The sequences of the beds exposed in the arroyo walls at the artifact sites are presented in Figures 8 and 9. Also shown are five other characteristic profiles out of some twenty-five measured. These profiles represent the exposed beds on the Wet Leggett from one-third mile below the spring to 1.5 miles below Pine Lawn and allow correlation of the beds. The location of profiles A to J is shown in Figure 4, that of profiles K to N in Figure 3.

At Locus B, Figures 6, 7 and 8, the general profile is this:

d, 5 to 10 cm. rusty-brown silt with basalt pebbles. Present only at north end.

c, 40 cm. dark gray, loose, ashlike silt with sharp sand grains and small pebbles.

b3, *b2*, *b1*, 45 cm., 40 cm., and up to 120 cm., respectively, clayey, sandy, and pebbly silt. When dry, as the material was in July, 1947, it is firmly cemented by colloids and forms a silt rock, but lumps fall slowly apart in water. Beds *b3* and *b1* are light gray when dry; bed *b2* is dark gray.

a, up to 1.5 meters gray to brownish gray silty, cobbly, and bouldery gravel; when dry firmly cemented by colloidal clay.

Dr. Sharat K. Roy and Dr. Robert Wyant, of Chicago Natural History Museum, found the pebbles and sand grains in beds *b* and *c*

FIG. 6. Arroyo bank at Locus B, Wet Leggett Canyon.

to consist predominantly of quartz and orthoclase feldspar and to a minor degree of plagioclase, fluorite, hematite, biotite, tourmaline, and hornblende. The (principal) parent rock of bed *b* was probably a pegmatitic granite.

When deposited, beds *b* and *c* may have had essentially the same texture or grain size as they have today.[1] The dark color of the ashlike bed *c*, which is due to the incorporation of much humus, suggests a high ground-water table or flooding of the valley floor by water from spring and brook. Pronounced rusty iron mottling in the cemented bed *b*, resulting from alternating oxidation and

[1] Dr. William P. Martin and Mr. Joel E. Fletcher of Tucson have given valuable advice on the soil-forming processes in these beds.

reduction, shows that the water table has fluctuated (Kellogg, 1936, p. 26). The water has leached soluble constituents and has transported others in suspension to lower levels. Thus bed *c* has lost material, and bed *b* has gained colloids and become sticky and compact, more firmly cemented. The soil may be either an intrazonal

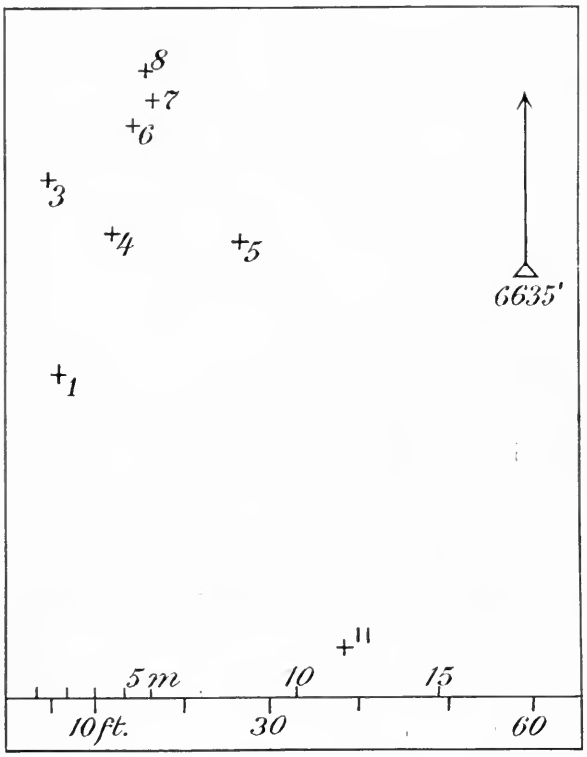


FIG. 7. Location of artifacts at Locus B. This area is shown in Figure 4.

planosol (clay-pan), or a young intrazonal ground-water podzol (Soils and Men, 1938, pp. 975, 995, 1000, 1101, 1168, 1174). The podzolization, if any, has not gone far, for the ashlike layer is only slightly acid, and bed *b* is neutral.

At numerous places from one-third mile below the Wet Leggett spring to within 0.6 mile of the highway (profile K) there is seen below the coarse gravel, bed *a*, a somewhat indurated, in places pebbly silt of sharp orange color (Fig. 9, D, I, K, bed *t*). This silt, which resembles the silt exposed in highway cuts two miles north

of Pine Lawn, is presumably of Tertiary age. It was eroded unevenly before the cobbly gravel was deposited.

The cemented gravel and the cemented silt, beds *a* and *b*, are gray in the center of the valley down to about a mile below the spring, but below this point and toward the sides of the valley-fill, the color changes through yellowish gray and brownish gray to brown and red brown. This is probably due both to differences in the debris

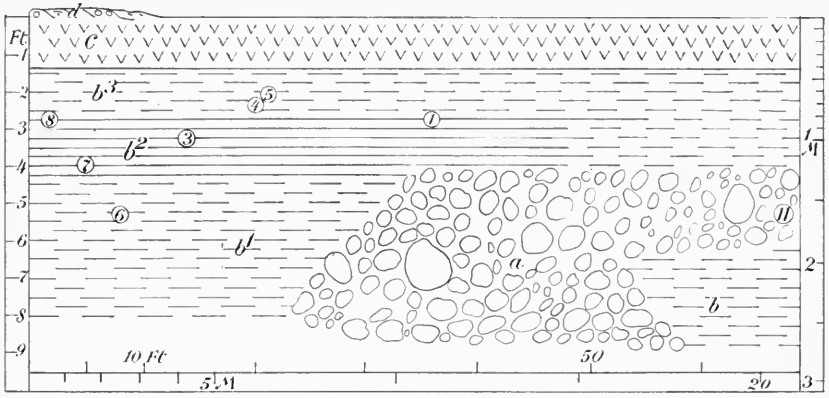


FIG. 8. Somewhat idealized north-south profile of beds at Locus B, with stratigraphic position of artifacts. Areal location of artifacts is shown in Figure 7. Artifacts: at point No. 11, metate; at No. 6, chopper; at No. 7, metate; at No. 3, mano; at No. 1, chopper; at No. 8, mano; at No. 4, projectile points; at No. 5, chopper and scraper.

brought by the main stream and by the tributaries, and to gradually changing weathering processes with decreasing moisture.

At nine places, distributed from Locus B to within 0.6 mile of the highway, there is an upper cobbly gravel, bed *u* (Figs. 8; 9, *I, K;* and 10). It seems to consist of lenses, for the longest exposure is only 50 meters. The greatest observed thickness is 60 cm.

The dark gray ashlike silt, bed *c*, which forms most of the ground surface, has been more or less eroded during the last decades and has a varying thickness up to 90 cm. It extends from Locus A for almost a mile downstream. From here, one-quarter mile below Natural Bridge, to the abandoned old ranch, 2.2 miles below the spring or 0.8 mile above the highway, the top bed is a dark gray clayey silt 30 to 60 cm. thick. The top bed is then dark brown for a mile, and still farther downstream is brown, clayey silt.

Bed *d* is up to 15 cm. thick and consists here of brown pebbly silt, there of a pavement of red brown pebbles and cobbles of basalt.

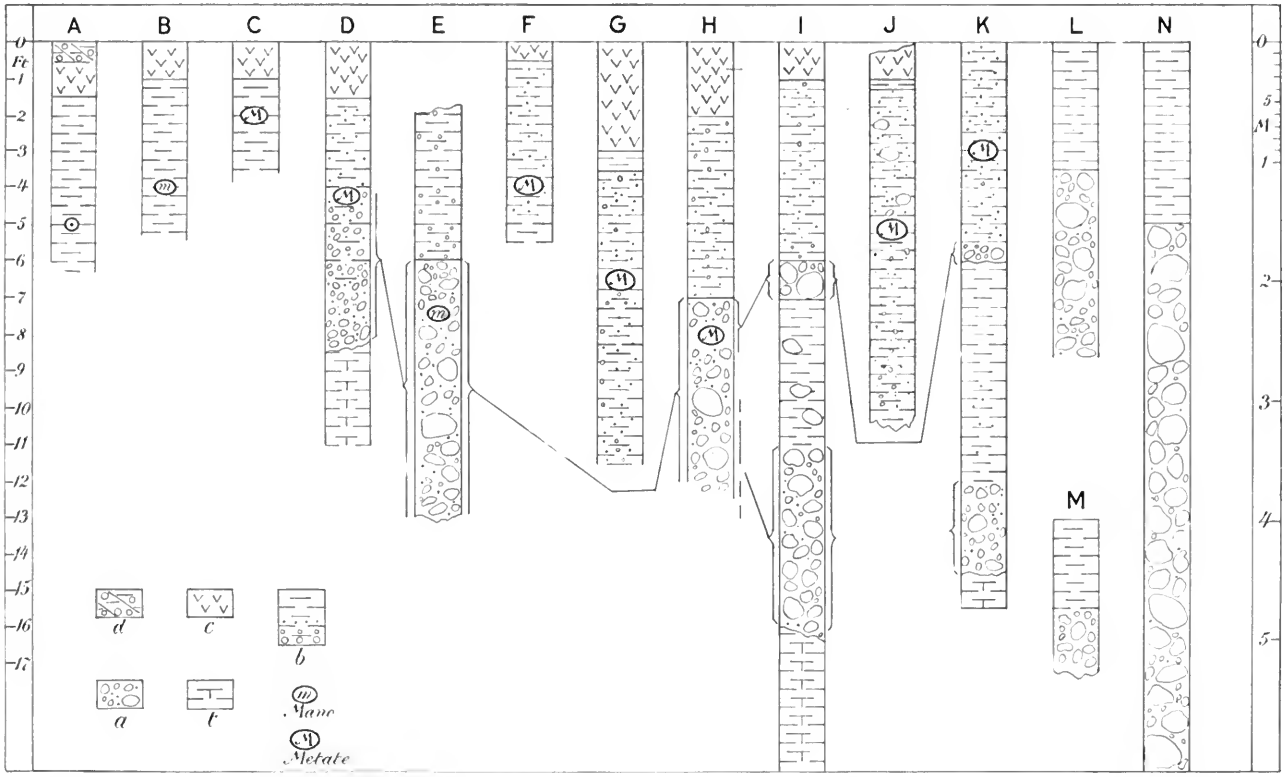


FIG. 9. Profiles of beds exposed in arroyo walls of Wet Leggett: Bed *t*, indurated orange-colored silt, presumably of Tertiary age; bed *a*, cemented coarse gravel; bed *b*, cemented clayey silt, frequently sandy or pebbly, rarely cobbly; bed *c*, dark gray, loose, ash-like silt; bed *d*, rusty-brown silt with basalt pebbles, or a stone pavement. Circle in profile A marks a longbone.

It was observed intermittently on the sides of the small valley from Locus A to a point one-half mile downstream. It is probably a down-wash associated with the modern erosion.

The beds will be further discussed in the next section.

CONDITIONS OF EROSION AND DEPOSITION AND CLIMATIC SIGNIFICANCE OF BEDS

Role of Plant-and-Soil Mantle

A carpet of live vegetation and of porous plant litter has an extraordinary ability to bind the soil, to retain the water of even excessive rains, and to keep it clear or free from mud which would clog pores and channels and prevent infiltration; and the underlying humus-charged topsoil is highly absorptive owing to its spongelike structure (Soils and Men, 1938, pp. 595, 609–610, 620–623). The effectiveness of a well-developed vegetation and soil in neutralizing heavy rains is strikingly illustrated on steep slopes in Utah and Idaho (R. W. Bailey, 1941).

In contrast, an impaired plant-and-soil mantle even on a gentle slope sheds most of the water of hard showers and permits it to rush downhill, to wash away soil, and to collect into torrents. Consequently, most past and modern erosions in the semi-arid West may have been caused by a reduction of the plant cover so that it permits occasional hard rains to produce violent floods that tear up valley floors and stream beds (Rich, 1911, pp. 241–244; Bryan, 1941, p. 235). The modern impairment of the vegetation, in turn, may have been mainly brought about by overgrazing and activities of white man (Rich, 1911, p. 242; R. W. Bailey, 1941, pp. 245, 250; Thornthwaite, Sharpe, and Dosch, 1942, pp. 2, 123, 127), for in most regions the erosion followed shortly upon the extraordinary influx of livestock, and it began in southern New Mexico and southern Arizona during the 1880's (Bryan, 1925; Thornthwaite, Sharpe, and Dosch, 1942, pp. 102–107). During the past decades the erosion has been accelerated by recurring, intense droughts. In the past the thinning and other deterioration of the vegetation cover which permitted the erosion must have been caused by drought. Since in some regions the modern arroyo cutting began before the introduction of cattle and sheep, Bryan (1941, pp. 232–236) and others ascribe the modern erosion also to increasing dryness, a climatic change unfavorable for the vegetation. In this view overgrazing becomes merely the trigger pull that set off the channel erosion.

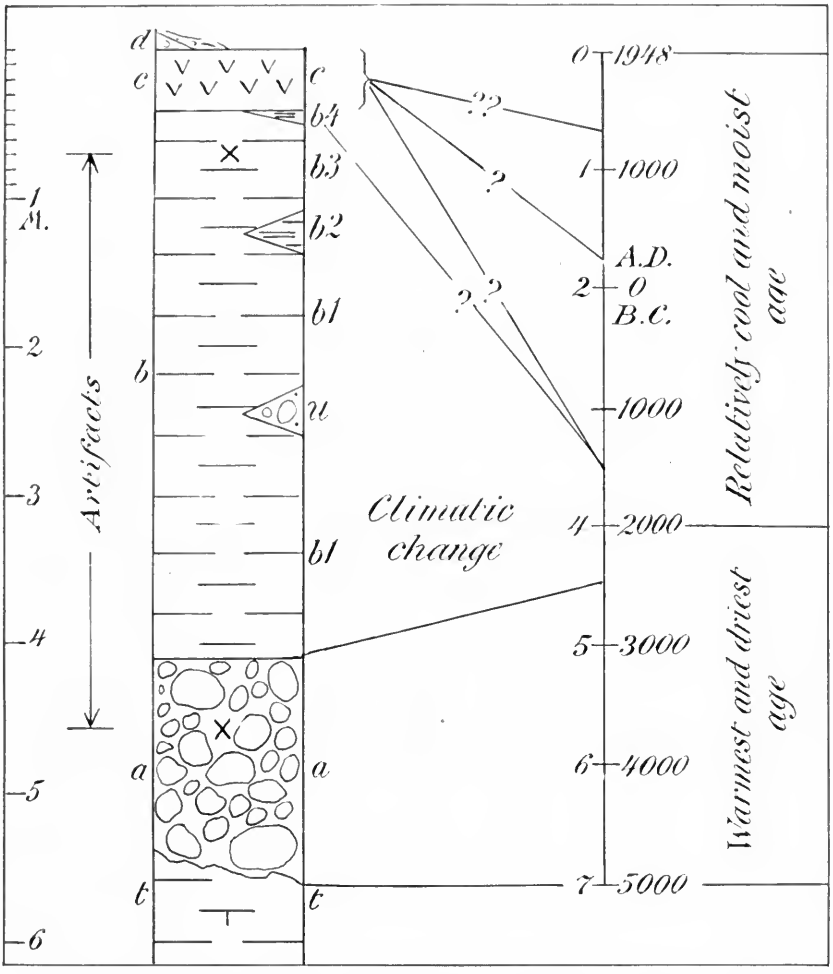


FIG. 10. Sequence of beds, climatic history, and age of Cochise artifacts.

Modern Channel Erosion and Deposition

The artifacts on the Wet Leggett were exposed by the modern erosion which in the site area has cut steep-walled gullies that are mostly 4 to 5 meters but locally 7 meters deep, and which usually are wider than they are deep. Below the road-crossing the channel is only about a meter deep, because the down-cutting is retarded by basalt sills at Pine Lawn and three-quarters of a mile below Pine Lawn. Above Old Ranch the channels are still being widened and deepened.

When the arroyo is running, fine-grained debris is carried far downstream, while pebbles, cobbles, and boulders are transported longer or shorter stretches or are merely lowered by under-cutting. Because of decrease in the gradient and increase in the width of the arroyo, fairly large amounts of coarse material have been dropped between a point 0.3 mile below Old Ranch and Pine Lawn (Figs. 3, 11). Between the road-crossing and Pine Lawn there are, at intervals

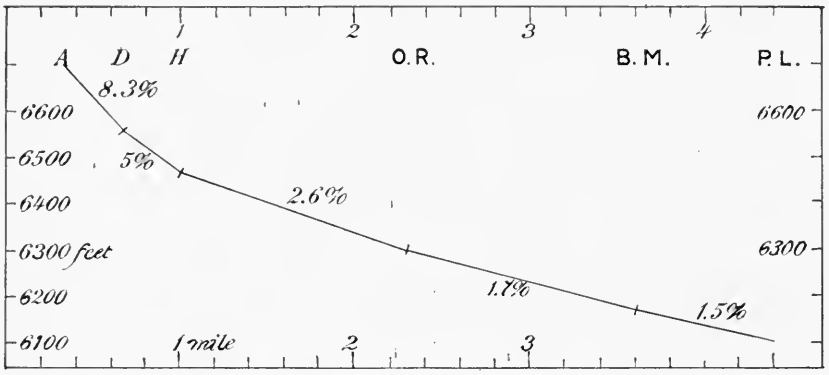


FIG. 11. Gradient of Wet Leggett Valley from Locus A to Pine Lawn. O.R.= Old Ranch; B.M.=bench mark 6,175 feet; P.L.=Pine Lawn. Mileage counted from Wet Leggett spring.

of 30 or more meters, fans of cobbles and boulders rising one-half to one meter above the general level of the stream bed. Most of these accumulations have been bypassed but some have been dissected by later floods. In the intervening main reaches the stream bed consists of preponderantly medium-coarse gravel, while in shelter of boulder fans some fine-textured material has been deposited. The present erosion in the Wet Leggett Valley, which naturally leaves a coarse-grained residue, is thus accompanied by deposition of largely heavy debris from one to three miles downstream.

Old Channel Erosion and Deposition

The old channel in the Tertiary(?) silt and its contained buried cobbly and bouldery gravel (bed *a*) in the Wet Leggett Valley record a past erosion and accompanying deposition (Fig. 10). This old erosion progressed far beyond the present stage of the modern one, for during it such coarse gravel as is now accumulating about four miles below Wet Leggett spring was deposited throughout the length of the valley up to Locus A, one-third mile below the spring.

The erosion, transportation, assortment, and deposition were influenced by several conditions. The valley was steep and the maximum length of the arroyo down to the sill at Pine Lawn was about four miles. In this reach the valley axis now drops 600 feet, and the gradient ranges from 8.3 to 1.5 per cent (1 per cent equaling 52.8 feet per mile; Fig. 11). The high waters were confined to the arroyo and deepened and widened the channel to accommodate the biggest floods, which did not overflow its banks. These conditions tended to cause concentrated, violent arroyo floods after unusually heavy rains.

From observations of modern arroyo erosion the following procedure may be concluded. The arroyo cutting began at the lower end of the valley and proceeded backward, and the channel was gradually degraded and widened. Coarse debris was let down or was transported and dropped in the lower section of the incipient arroyo and below it, just as in modern time; and the bed, or chain of fans, of coarse gravel grew mainly backward by matter added to its up-valley end. Though medium and fine-textured materials were dropped during falling flood stages on the inside of bends, in the lee of boulder fans, and in other comparatively quiet sections of the arroyo, most of these deposits were again picked up and swept farther downstream during rising stages or during exceptional floods. Then also boulder fans were dissected and in part removed. Since all the coarse gravel postulated a strong current and a confining arroyo for transportation, in the end little medium and fine-textured debris could remain in the short and steep arroyo.

These partly theoretical conclusions seem to be supported by the normally abrupt transition from gravel to overlying silt. Only at Natural Bridge (Fig. 4, I), in the lee of a gravel fan, is this silt decidedly cobbly, suggesting deposition because of sudden slackening of swift current. This cobbly silt may or may not be contemporaneous with the gravel.

Thus, as the head of the old Wet Leggett arroyo retreated by erosion, coarse gravel was dropped in the channel on the spot or some distance down-valley, and this debris bed, or chain of fans, grew upstream by back-filling, but little medium and fine-textured material was permanently deposited on top of the heavy gravel in any part of the arroyo. In other words, the coarse gravel bed *a* is practically the only deposit in the valley from the age of erosion. The erosion, assortment, transportation, and deposition were carried out by strong arroyo floods, permitted by a sparse vegetation, and

were in the last instance caused by a dry climate. The erosion and the gravel record a dry age.

Old Channel Filling

As mentioned, there is between two gravels at Natural Bridge a wedge of mixed debris containing numerous cobbles. This and other local, unassorted deposits might date from the age of erosion.

The bulk of the material directly overlying the gravel, however, consists of fine silt or of silt with scattered pebbles (bed *b1*, Fig. 10). By its stratigraphic position at least the lower part of this bed is a channel fill, yet, because of its fine texture and considerable thickness it could not well have been deposited in a steep arroyo swept by violent floods. No such silt bed is forming in the modern arroyo. The old silt bed was in all probability deposited under changed conditions.

Undoubtedly the arroyo floods had then relatively low crests and slow speed, and were comparatively small and gentle. This suggests that the vegetation mat had become adequate to absorb and retard much or most of the water of hard rains, and that grass, shrubs, and trees had invaded the arroyo, checking the water flow. Still, the accessibility of plentiful debris shows that the restoration of the plant cover was only partial.

The arroyo filling was due to delivery of more debris than was removed from or transported through the arroyo. The filling may have begun at several places, as at the mouths of tributaries, on the inside of bends in the channel, at points where vegetation had got a foothold, and where the gradient was comparatively low and the channel wide. A detailed discussion of such procedures is given by Happ, Rittenhouse, and Dobson (1940, pp. 23–31). The fill-material was supplied by the main stream, tributaries, sheet wash, and slumping of arroyo banks; and it was deposited chiefly as fans, talus, and accumulations among and behind obstructions, such as shrubs, trees, and dams of driftwood and vegetable débris. The conditions of the arroyo filling, especially the recovery of the vegetation, suggest that the climate was in the process of changing from dry to relatively moist.

At nine places in the arroyo walls from Locus B to station *K*, two miles downstream, there was observed an upper gravel, bed *u*, with a maximum thickness of 60 cm. and a greatest length of exposure of 50 meters (Figs. 8; 9, *I*, *K;* and 10). Since the arroyo walls elsewhere in the same reach presented only one gravel, the one discussed

above (bed *a*), the upper gravel does not form a continuous layer, but probably consists only of small patches or lenses. At Natural Bridge (station I), a point 0.8 mile downstream, and probably at Locus B the upper gravel forms down-valley tails of the tops of cobble fans, the intercalated silt being wedges (Fig. 8). In these cases, a strong current seems to have shaved off the crests of the fans and to have spread the cobbles and boulders a little. Perhaps other gravel patches had a similar origin.

Though the gravel lenses are discontinuous, their similar position in the profiles strongly suggests that they were formed at about the same time, and are correlatives. Since the material is of small volume and at least in some cases from local sources, the gravel patches need not represent any length of time. They could have been formed during a single very exceptional flood down the healed, but not yet quite filled arroyo during the transition from a dry to a relatively moist climate. Still, there is perhaps a remote possibility that the gravel lenses record a dry age of some duration.

After the upper gravel lenses *u* were laid down, the deposition of the silt *b1* was continued or resumed. When the channel had ceased to be a steep-walled, easily enlarged arroyo and was partly filled, it was no longer capable of containing the flood waters, which then spread over the low bordering land dropping the suspended silt load, as the flow was retarded by the grass carpet. In this manner the flooded area was slowly aggraded.

At a point 70 meters above Locus B there are three dark gray zones, 20, 8, and 30 cm. thick and separated by 10 and 15 cm. of lighter silt; and at Locus B and a point 40 meters below station F there are single dark gray silt zones, 40 and 30 cm. thick, respectively (bed *b2*, Fig. 10). The dark gray coloring may be due to a high content of organic matter or humus and to excessive moisture and insufficient oxygen after the deposition (cf. Kellogg, 1936, p. 5; Soils and Men, 1938, pp. 892, 932, 938). Since no corresponding zones were observed elsewhere, the dark color may be limited to patches. These probably represent slight depressions that were sufficiently watered by spring and brook to form grass meadows, yet, owing to diverting alluvial dams, escaped being filled by silt.

After some length of time, however, silt deposition was resumed, for the dark gray zones are overlaid by 45 to 75 cm. of light gray silt, bed *b3*.

At a point 80 meters below station E and at G and J there are single dark gray zones, 10 to 15 cm. thick, at the top of the cemented

silt (bed *b4*, Fig. 10). They probably had an origin similar to those just discussed. A bluish tint at station G suggests reduced iron compounds as an additional color factor.

The silt bed *b* is thus for the most part a single, homogeneous deposit that is only locally divisible into the subordinate beds *b1* to *b4*. The entire deposit was accumulated without marked interruption during an age of climatic change. The climate had become moist enough to support a considerable vegetation, but it was still too dry to provide a fully protective plant cover, for plentiful debris was available to the waters of heavy rains. The climate was neither distinctly dry nor moist for the region.

From Locus A to one-quarter mile below Natural Bridge, bed *b* is overlaid by a dark gray powdery, ashlike silt *c*. Though the two beds differ physically in a striking way, they are petrographically identical and have the same parent rock (see above). The loose silt has more humus, less fine sand, and practically no fine clay, while bed *b* has considerable colloidal clay which cements it into a firm rock when dry. Bed *c* was deposited under climatic conditions similar to those prevailing when bed *b* was deposited.

Soil-forming Processes

Since the ashlike silt *c* was laid down it has surely lost soluble constituents through leaching, and colloids through removal in suspension, through eluviation; and these materials have been largely incorporated in the underlying bed *b*. It is not certain, however, that these processes account for the entire difference between the beds, that the beds were formed *in situ* from the same geological deposit. It is possible that bed *c* was laid down after a time interval and that its material was already considerably leached and eluviated when laid down. Further study is necessary to determine which was the case. In any event, the loose silt was deposited a long time ago.

The cessation of silt deposition in the upper part of the small Wet Leggett Valley indicates that the vegetative carpet had become adequate to halt erosion farther upstream; and the absence of later prehistoric erosion demonstrates that it remained so until destroyed by overgrazing some decades ago. Also the movement of solubles and of colloids from the ashlike silt *c* to bed *b*, the high content of humus in the former, and the predominantly gray colors of both, show that this part of the valley has been well watered by spring and brook since the deposition of bed *c*. Rusty brown mottling of bed *b*,

due to partial oxidation of iron compounds, indicates, however, that the ground water table, though generally high, has undergone fluctuations.

The same climatic variations might be recorded in the top silt at station K below Old Ranch by alternation of dark brown and light brown layers, 5 to 15 cm. thick. Thus, the dark, humus-rich laminae may indicate moist ages with luxurious vegetation and little or no silt deposition, and the light, slightly humus-stained layers may mark relatively dry ages with aggradation. In this part of the valley some silt deposition may well have occurred after it had ceased next below the spring.

These conditions, as well as the presence of much humus in the topmost meter of the silts below Old Ranch, show that the age since the deposition of the ashlike layer *c*—the prehistoric age—was most of the time relatively moist.

Summary

The old channel erosion and the accompanying deposition of coarse gravel, bed *a*, mark a long and pronounced dry age (Fig. 10). The deposition of the cemented silt *b* (*b1* to *b4*) and the ashlike silt *c* indicates a climate that was neither decidedly dry nor moist for the region. Bed *b* was laid down without a marked interruption. Bed *c* either followed directly upon *b* or after a time interval of relatively moist climate. The age since bed *c* was deposited has mostly been moist.

STRATIGRAPHIC OCCURRENCE OF THE ARTIFACTS

The stratigraphic position of the Cochise stone artifacts is shown in Figures 8, 9, and 10. Figure 8 is a north-south profile at Locus B which has been idealized because the beds are sloping and uneven, the ground cut up by modern erosion, and the vertical and the horizontal scales in the figure are unequal. The profile shows the mean thicknesses of the beds, and the artifacts are indicated in relation to the nearest recognizable bed limit, not always at their absolute depth below the ground surface.

The implements are distributed from 45 cm. down in the lower coarse gravel *a* (Fig. 9, *E*) to within 30 cm. of the top of the cemented silt *b3* (Figs. 8, No. 5; and 9, *C*). At Locus B their vertical range is a meter; in the ideal profile, Figure 10, it is 4 meters. A mano found at station E surely occurs in the lower gravel *a*, the only gravel at the place, and a metate at station H probably does so. This

metate occurs at a depth of 30 cm. in the bouldery gravel where it forms one bed, a short distance north of the point where it is divided by a wedge of cobbly silt. At Locus B the implement in the upper gravel is a metate, the lowest artifact in the silt is a chopper, and the highest ones are chopper, scraper, and projectile points (Fig. 8).

CLIMATIC HISTORY AND THE AGE OF THE COCHISE ARTIFACTS

In the region from central Texas to the state of Washington the records of stream erosion, lakes, dunes, glaciers, and vegetation suggest that the last few thousand years have for the most part been relatively cool and moist, and that the preceding age was decidedly warmer and drier (summaries and references in Hansen, 1947; Antevs, 1948).

From the somewhat divergent conclusions of several Scandinavian students it appears that the age about 5000–2500 B.C. was the warmest part of the post-glacial in northern Europe, and that the age 6000–1200 B.C. had higher summer temperatures than the present. The transition from dry to relatively moist climate in the American West is roughly dated by the amounts of salts that were present, in 1887 to 1912, in the waters of Abert and Summer lakes in Oregon and Owens Lake in California, which have not overflowed in postpluvial times. Since the salts have required some 4,000 years to accumulate (Van Winkle, 1914, pp. 117–123; Gale, 1915, pp. 259, 263, 264), it may be concluded that the modern lakes were reborn and the change to a relatively moist climate occurred about 2000 B.C. This date should probably be taken as the division line between the two distinct climatic ages, although the recognition of a separate transition age, comprising about 2500–1500 B.C., would be useful in the present case.

The cool and moist age that began some 4,000 years ago has, of course, not been climatically uniform. A light drought early in the Christian era is suggested by a small erosion, its stratigraphic position, and the presence of a plain potsherd in southeastern Arizona (Sayles and Antevs, 1941, pp. 43, 44, 56). The same dry episode is possibly indicated by an unconformity in the Calamity formation in Trans-Pecos Texas (Bryan and Albritton, 1943, p. 486).

A later, more severe drought has been recognized by erosion in northeastern Arizona (Hack, 1942, pp. 51, 58, 68), in southeastern Arizona (Sayles and Antevs, 1941, pp. 43, 56), in Trans-Pecos Texas (post-Calamity erosion; Bryan and Albritton, 1943, pp. 486–487), and on the Texas High Plains ("renewed deflation"; Evans

and Meade, 1945, pp. 499–503). The erosion in northeastern Arizona is archaeologically dated at late Pueblo III time, or at ca. A.D. 1300; that in southeastern Arizona by potsherds in contemporary beds at after A.D. 1200; that in Trans-Pecos Texas by El Paso Polychrome pottery in the overlying Kokernot beds from possibly A.D. 1200 to 1400; and the erosion on the Texas High Plains by sherds before A.D. 1300 or 1400. The erosions may thus have been caused by a single widespread drought, probably the so-called "great drought" of A.D. 1276–99 (1273–1300), which is indicated by narrow tree rings in many parts of the Colorado Plateau, but not by Douglass' best sequoia record from the west flank of the Sierra Nevada (Douglass, 1935, pp. 49, 64, and 1945, vol. 11, p. 28; Schulman, 1947a).

The most pronounced later drought on the Colorado Plateau and in southern California was from A.D. 1573 to 1593 (1571–97) (Schulman, 1946, p. 45; 1947b, p. 33), but this is not known to be recorded by erosion.

The climatic sequence concluded from the evidence in the Wet Leggett Valley fits well into this climatic history of the greater region: The old channel erosion and accompanying gravel deposition represent the warmest and driest post-glacial age, 5000 to 2500 B.C.; and the arroyo filling, or the deposition of the cemented silt *b* and perhaps that of the loose silt *c*, correlate with the transition from dry to moist climate, from about 2500 to 1500 B.C. (Fig. 10). Bed *c* might have been deposited either during the brief drought early in the Christian era or during that ca. A.D. 1300. However, since no potsherds have been observed either in this or in any other bed in the upper Wet Leggett Valley, its deposition during the later date is not probable.

The mano in the lower gravel at station E, 0.45 mile below Locus A, was embedded a considerable time before the end of the gravel deposition, for this proceeded backward. If the metate at site H, 0.2 mile farther down-valley, really belongs in the lower gravel, it is still older.

The Cochise artifacts in the Wet Leggett Valley, then, seem to cover the age from 3000 to 1500 B.C., to range in age from 5,000 to 3,500 years.

V. ARCHAEOLOGY OF THE WET LEGGETT

All material from this site was found in or on the banks of Wet Leggett arroyo, which is a tributary of the main Leggett drainage and forms with it the west-central section of Pine Lawn Valley. Here drought, over-grazing, a steep gradient, and other factors have contributed to the formation of a deep gulley that has cut through an accumulation of fill in an older small valley. Thus gravel lenses have been laid bare, silt layers cut through, and milling stones, scrapers, hand axes and other tools and utensils uncovered therein (see chap. IV).

These artifacts, which are identified with the Pine Lawn Valley variation of the Chiricahua stage of the Cochise culture, are found in fine-grained deposits, several feet thick, consisting of light gray to dark gray firmly cemented beds, and in coarse gravel deposits. These materials overlie, contain, and underlie the artifacts and are in turn covered by an ashy gray silt from one to two feet thick. This silt may be at or near the surface, depending on how well the thin humus layer has been able to withstand the erosion on what is a fairly steep gradient. At the head of the arroyo there are two warm springs that drain partly into the arroyo and are partly diverted in a ditch. These are permanent springs and in all probability were running when the site was occupied.

This Wet Leggett site was first noted by Mr. E. B. Sayles and Dr. John Rinaldo during an archaeological survey, in the course of which they checked cienagas, basins, arroyos, cut banks, and old springs for sites yielding stone artifacts but no pottery. An area within a radius of fifteen miles of Reserve was covered (see pp. 22–23). The smaller artifacts were collected at the time of discovery, and the larger artifacts such as metates left *in situ*. Then the arroyo was surveyed intermittently throughout the remainder of the season for other artifacts that might show up after the seasonal rains had started.

Several days were spent in trenching two locations (Locus A and Locus B) where the major concentrations of artifacts appeared (see chap. III). These trenches were made at right angles to the course of the arroyo and were cut down to the sterile zone. In two other

instances, tongues of land at the junction of the main and tributary arroyos were cut down to a level below the artifact-bearing zone. No artifacts were found by this method.

After the rainy season started, about forty more artifacts were discovered in place embedded in the cemented silts. The locations of these were mapped by means of rod and instrument and found to be at depths ranging from 30 cm. to 2.5 meters below the surface. The artifacts were scattered along the arroyo for a distance of approximately two miles, although most of them were found along the upper third of the arroyo toward the springs.

ARTIFACTS

The artifacts identified with this stage include manos and metates; tools made by percussion flaking, such as scrapers and hand axes; and a minor number of tools fashioned by pressure flaking.

The manos are small, one-hand types. These are either roughly symmetrical and oval, or rectangular with rounded ends in outline. These implements have one or more slightly convex grinding surfaces. The lower surfaces of all specimens are parallel to the upper surfaces. None are even slightly wedge-shaped in cross section. In general, their conformation suggests that they were used on metates of slab or basin type.

The metates are large, thick slabs of stone of rather irregular shape in outline. They tend to be longer than they are broad. They show no marks of working except those from use. There are no marks of pecking or hammering on the edges or lower surfaces. The bottom surface is frequently angular, the upper or milling surface usually slightly concave, especially toward the center, and quite smooth. Occasionally there are marks of pecking or of hammering around the margins of the milling surface. One aberrant specimen (Fig. 12) was found at the lower end of the arroyo near its junction with the main Leggett canyon. This is a deeply troughed or basined metate with the trough open at one end only. The sides of the trough are incurved and the opening so constricted that this metate might be classified as an open basin type.

The chipped stone implements from the site are hand axes (choppers), scrapers, knives, blades, projectile points, and gravers. The hand axes, or choppers, are of the plano-convex type. They are with one exception rough, angular cores with a portion of the crust left intact. All have been chipped by percussion chipping along one or more surfaces to form a sharp cutting edge.

The scrapers were made of both thick and thin primary flakes. The majority of these are plano-convex flakes with percussion chipping on the convex surface and secondary chipping (possibly from use) along one edge. A few are biconvex and have been chipped on all surfaces. The plano-convex types range from true scrapers to a type of implement that might be termed a flake knife, the biconvex types to a type of implement usually termed a "blade."

One large flake core or nucleus was saved. Other cores were found, but it remained doubtful whether they were the products of natural agencies or a flint industry and they were left on the site.

Small, thick, random plano-convex flakes were found that show some possible use as knives. Along one edge these flakes have some secondary chipping that appears to be the result of use. A few equally small, albeit thicker biconvex flakes were fashioned into blades, which show chipping on all surfaces and along all edges. One fragment has been chipped to a point.

One projectile point was found—a short, stubby corner-notched point with a slightly concave base. It is fashioned of obsidian and shows secondary chipping on all surfaces.

AFFILIATION OF THE WET LEGGETT ARTIFACTS

Shortly after discovery, the Wet Leggett artifacts were tentatively identified typologically with the Chiricahua stage of the Cochise culture by Sayles, Antevs, and Rinaldo. However, it was recognized at that time that more certain identification awaited detailed study and comparison.

In this analysis two aspects were considered: (1) a comparison of the proportions of chipped stone to ground stone implements (in this case primarily milling stones); (2) a typological comparison.

The frequency of the tools in the Wet Leggett site was as follows:

Manos	3
Metates	7
Projectile points	1
Blades	6
Flake knives	7
Scrapers	9
Choppers	3
Gravers	2
Cores	2
Total	40

This summary indicates that the ratio of chipped implements to ground stone implements is 4 to 1. This proportion is more

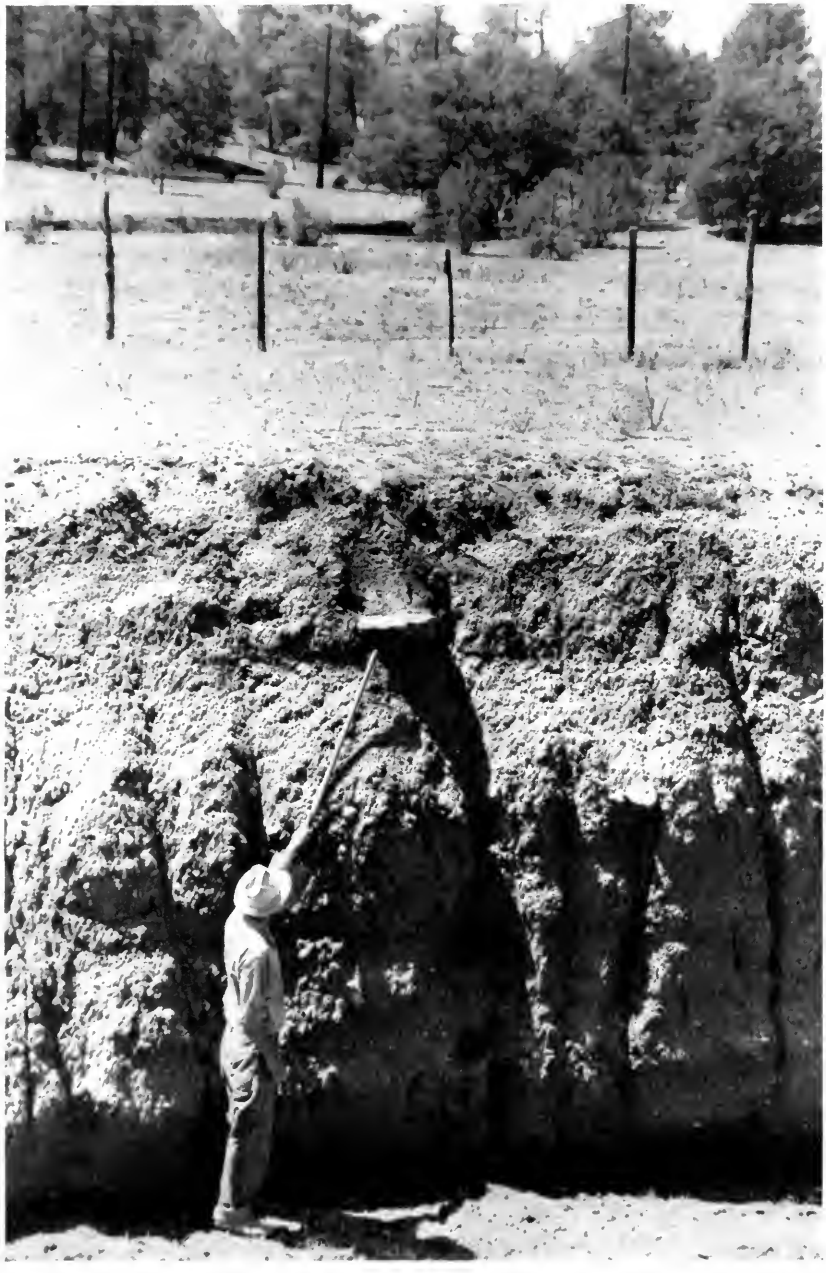


FIG. 12. Metate *in situ* at Station K, Wet Leggett.

like that of the San Pedro stage of the Cochise culture than it is like that of the Chiricahua stage. In the San Pedro stage, chipped stone implements exceed ground stone implements in the ratio of 2 to 1, whereas in the Chiricahua stage almost five times as many ground stone tools are found as flaked tools. On the other hand, the proportion of the Wet Leggett tools is generally more like that of the San Pedro stage of the Cochise culture than it is like that of the Lake Mohave or Pinto Basin cultures of the Great Basin or that of the Folsom culture of the plains. In these latter cultures the ratio of chipped stone implements to ground stone implements is as great as 12 to 1. Therefore it is apparent that the Wet Leggett artifacts are most like those of the Cochise culture as a whole from the point of view of the relative numbers of ground and chipped stone implements.

From the point of view of typology, however, the Wet Leggett material is more like that of the Chiricahua stage than like that of the San Pedro stage of the Cochise culture. For example, the metates are with one exception all of the shallow basin or slab type, like those most frequent in sites of the Chiricahua stage. They are also similar in a general way to Pinto Basin metates (Amsden, 1935, Pl. 7a).

The manos also are more like the Chiricahua handstones. They are not so asymmetrical as some of the Chiricahua specimens, but, like these, they are smaller, thinner, and lighter than the large, heavy, round, typical San Pedro type. Possibly the use of the smaller, lighter handstone is to be correlated with the use of a shallow basin metate, since the use of the large, heavy, round handstone may be correlated with the use of the deep basin metate (Sayles and Antevs, 1941, p. 24). Furthermore, they are like the handstones reported from Pinto Basin (Amsden, 1935, Pl. 7), where the shallow basin metate was also used. On the other hand, the Wet Leggett artifacts more closely resemble the Cochise implements than the Pinto Basin tools. Resemblance to Basket Maker II handstones reported from White Dog Cave is about as close as that to the Pinto Basin handstones, but similarities to other manos reported from like horizons are only of the most general sort.

The single projectile point found resembles most closely one of the points intrusive into the Chiricahua stage at Sonora F:10:31 (Sayles and Antevs, 1941, Pl. XIc). There is also a resemblance to one of the Pinto Basin projectile points (Amsden, 1935, Pl. 13n), which is shorter than most of the other Pinto Basin points illustrated

as typical. Furthermore, even in this instance the resemblance is less close than to the Chiricahua stage point, because the Wet Leggett specimen, like the Chiricahua stage specimen, lacks the long stem or shank of the Pinto Basin points.

One fragmentary blade resembles a pointed type illustrated from the Chiricahua stage (Sayles and Antevs, 1941, Pl. Xd). However, the majority of the Cochise specimens are large, leaf-shaped, plano-convex flakes with sharpened edges somewhat like another specimen illustrated on the same plate (Pl. Xc) as a plano-convex blade.

All of the scrapers recovered were side scrapers and comparable with the Chiricahua type implements. No end scrapers have yet been recovered, but the total number of artifacts is relatively small. Some may possibly be found as more artifacts are uncovered.

A small number of implements was recovered of a type that has been termed gravers. They are similar to implements illustrated by Amsden (1937, Pl. XXXVIg, f) but they lack the extremely fine point of the Folsom gravers (Roberts, 1935, Pl. 13). They have not been reported from the Cochise complex of southeastern Arizona.

The choppers resemble those of the Sulphur Springs and Chiricahua stages and some of the San Pedro stage. Like these, they are plano-convex in cross section and have been chipped only along one edge. They lack the trimming around the edge of the more typical San Pedro choppers and many of the Pinto Basin and Lake Mohave choppers (Sayles and Antevs, 1941, Pl. XVIa).

Another deviation from the reported Cochise complex of chipped stone tools is the category of flake knives, or flakes with cutting edges. They have been reported from the Pinto Basin and Lake Mohave sites (Amsden, 1935, p. 40) and from Folsom sites (Roberts, 1935, p. 28).

In summary, then, it might be said that the proportion of ground stone implements to chipped stone implements from the Wet Leggett site is more like that of the Cochise culture than like that of any of the other known Southwestern non-pottery horizons of equal age. Typologically, the Wet Leggett complex is most like that of the Chiricahua stage of the Cochise culture both in the ground stone implements and in the majority of the chipped stone implements, although in the chipped stone artifact types there are deviations that would set the Wet Leggett complex off as a variant of the Cochise culture. In these variations, as in some more general characteristics, it is like the Pinto Basin complex. Although the

archaeological evidence from the Wet Leggett site is relatively meager, it appears sufficient to indicate that the Wet Leggett complex represents an intermediate step between the main development of the Cochise culture on the one hand and the derived development of the Mimbres branch as manifested in the Pine Lawn Valley on the other.

DESCRIPTIONS AND ILLUSTRATIONS OF COCHISE ARTIFACTS

MANOS

(Fig. 13)

(a) With single, flat, grinding surface; surfaces parallel; roughly oval, symmetrical in outline 2
From Station 8, Locus B; Locus E
Lengths, 13.0, 12.2 cm.; widths, 8.5, 6.8 cm.; thicknesses, 4.6, 5.4 cm.

(b) With two slightly convex grinding surfaces; rectangular with rounded ends in outline; surfaces pecked 1
From Station 2, Locus A
Length, 12.1 cm.; width, 9.6 cm.; thickness, 4.8 cm.

FIG. 13. Manos, Wet Leggett Canyon. Length of bottom specimen, 12.1 cm.

METATES

(Figs. 14–16)

(a) Slab, or shallow basin type; thick slabs roughly oblong or round in outline; bottom surface angular and rough; upper surface slightly concave, smooth; margins of concavity frequently pecked..... 6

From Stations 7, 11, Locus B; Loci D, F, H, and J

Lengths, 38.4, 35.6, 31.5, 29.7, 22.2 cm.; widths, 22.3, 19.6, 23.2, 20.4 cm.; thicknesses, 9.2, 8.8, 9.7, 7.7, 9.3 cm.

(b) Open basin or trough type, trough open one end only, made from unshaped block of stone roughly oblong in outline, opening at lower end of trough slightly constricted; trough pecked; bottom and sides of trough concave. 1

From lower end of Wet Leggett arroyo

Length, 47.4 cm.; width, 36.4 cm.; thickness, 13.4 cm.

Dimensions of trough: length, 32 cm.; width, 19.2 cm.; depth, 4.8 cm.

FIG. 14. Metate from Station K, Wet Leggett Canyon. Length, 47.4 cm.

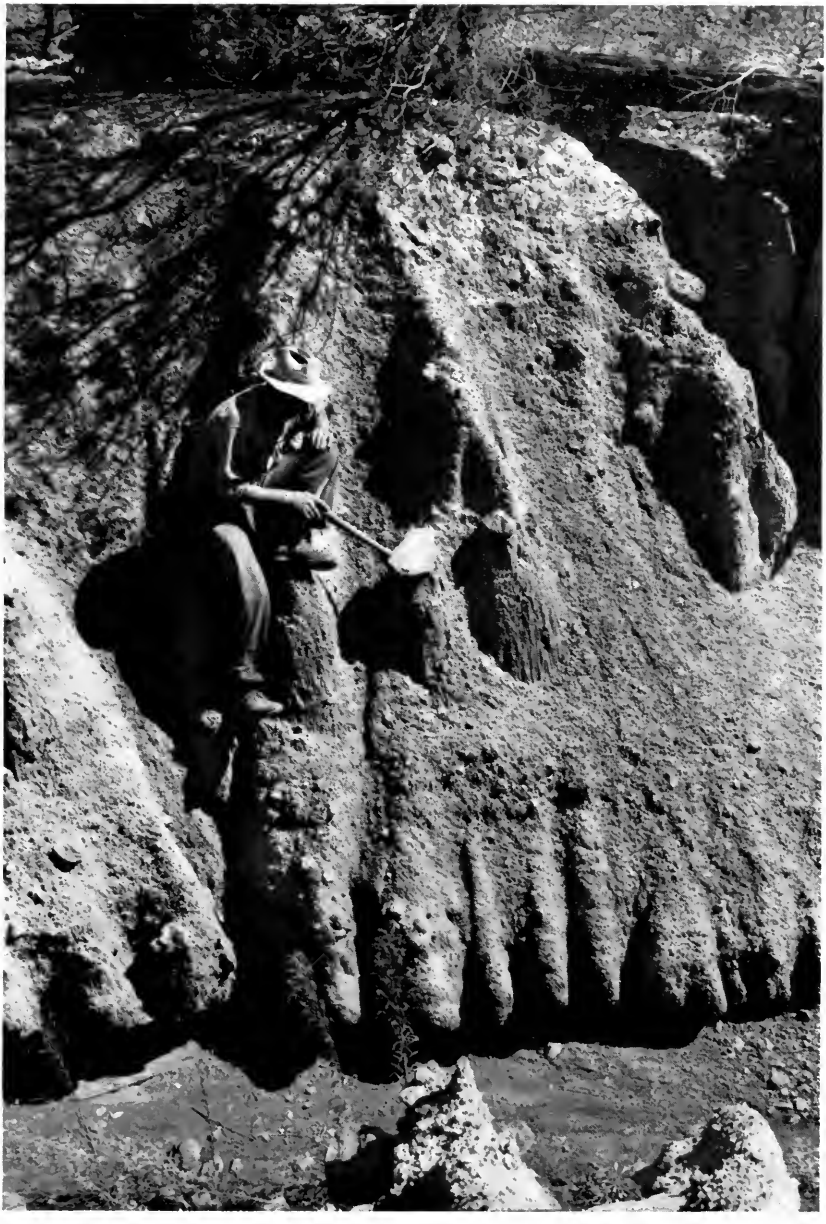


FIG. 15. Metate *in situ* at Station F, Wet Leggett Canyon. Length, 31.5 cm.

FIG. 16. Metate *in situ* at Station F, Wet Leggett Canyon.

PROJECTILE POINT

(Fig. 17)

Short, stubby, corner-notched point with slightly concave base; secondary chipping on all surfaces 1
From Station 4, Locus B
Length, 2.2 cm.; width, 1.9 cm.; thickness, 0.4 cm.
Material: Obsidian

BLADES

(Fig. 17)

(a) Small, squarish blade with secondary chipping on all surfaces 1
From near Station 9, Locus B
Length, 2.2 cm.; width, 2.0 cm.; thickness, 0.4 cm.

(b) Pointed tip of blade with percussion chipping on both surfaces and secondary chipping along edges; plano-convex in cross section 1
From near Station 1, Locus A
Length (fragmentary), 4 cm.; width, 2.8 cm.; thickness, 1.2 cm.
Materials: Obsidian, flint

(c) Large, leaf-shaped, plano-convex flakes with percussion chipping on one surface and secondary chipping along one edge, frequently pointed at one end 4
From Loci A, B
Lengths, 6.5, 8.9, 7.4, 6.8 cm.; widths, 3.4, 4.7, 4.6, 3.0 cm.; thicknesses, 1.1, 2.4, 1.6, 0.9 cm.

GRAVERS

(Fig. 17)

Flake or nodule with primary chipping on both surfaces and small point on one side projecting from a broad base 2
From Locus A
Lengths, 3.0, 4.0 cm.; widths, 3.2, 2.5 cm.; thicknesses, 0.9, 1.4 cm.

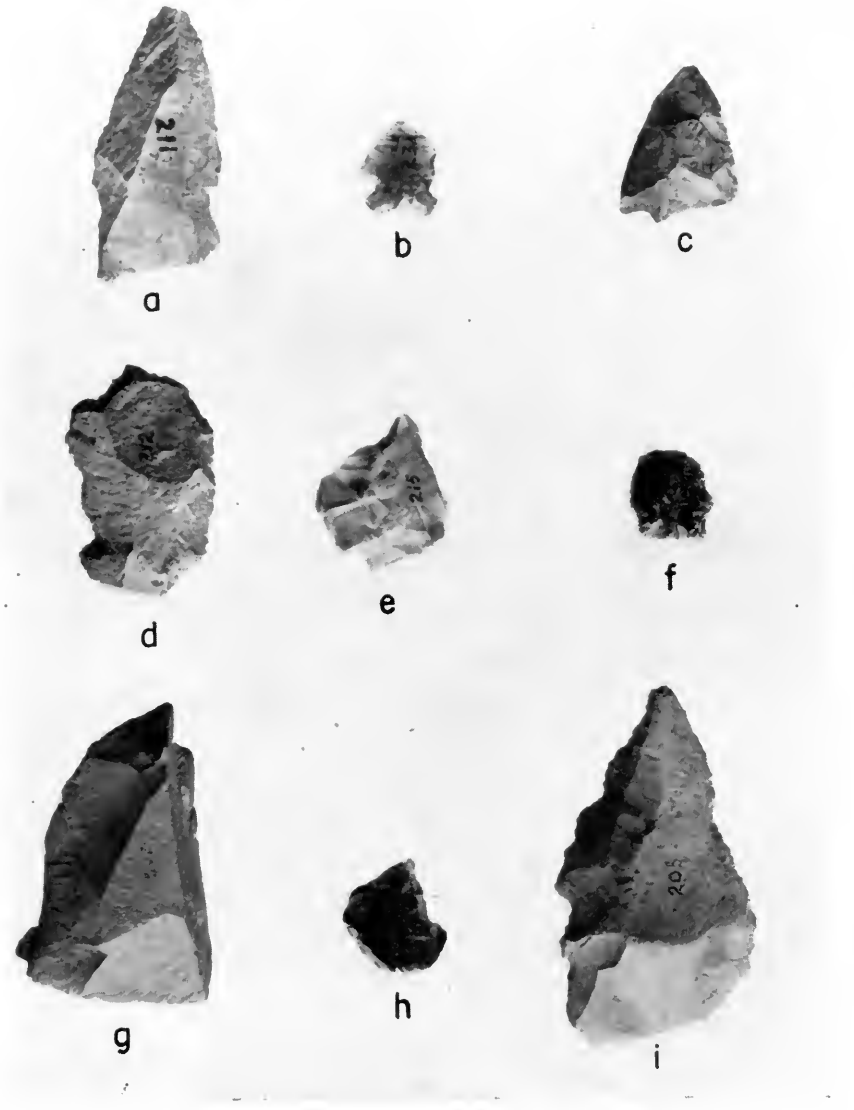


FIG. 17. Blades, projectile point, and gravers. *a*, *c*, *d*, *f*, *g*, *i*, blades; *b*, projectile point; *e*, *h*, gravers. Length of *i*, 8.9 cm. Wet Leggett Canyon.

FLAKE KNIVES

(Fig. 18)

Small, thin, random flakes showing chipping from use along sharp edges. . 7
From Locus A
Lengths, 3.7, 3.2, 3.0, 2.6, 3.5, 3.1, 2.9 cm.; widths, 2.7, 2.0, 1.8, 1.8, 2.9, 2.0, 1.4 cm.; thicknesses, 0.6, 0.6, 0.6, 0.5, 0.7, 0.5, 0.4 cm.

FIG. 18. Flake knives. Length of lower left specimen, 3.7 cm. Wet Leggett Canyon.

SCRAPERS

(Figs. 19, 20)

Large, thick, biconvex flakes with percussion chipping on all surfaces and secondary chipping along one or more edges..... 9

From Loci A, B

Lengths, 3.8, 4.0, 4.9, 5.9, 5.7, 7.4, 6.0, 8.2, 10.5 cm.; widths, 3.5, 3.7, 4.1 cm.; thicknesses, 1.0, 1.4 cm.

FIG. 19. Scrapers. Length of lower left specimen, 5.7 cm. Wet Leggett Canyon.

CHOPPERS

(Fig. 20)

Rough, angular cores with portion of crust still intact; heavy percussion flaking on some surfaces; secondary flaking (from use) along one edge.. 3

From Station 6, Locus B

Lengths, 12.5, 7.3, 8.1 cm.; widths, 10.5, 6.2, 7.1 cm.; thicknesses, 7.0, 5.4, 4.2 cm.

FIG. 20. Three choppers and a scraper. Length of scraper (lower left specimen), 10.5 cm. Wet Leggett Canyon.

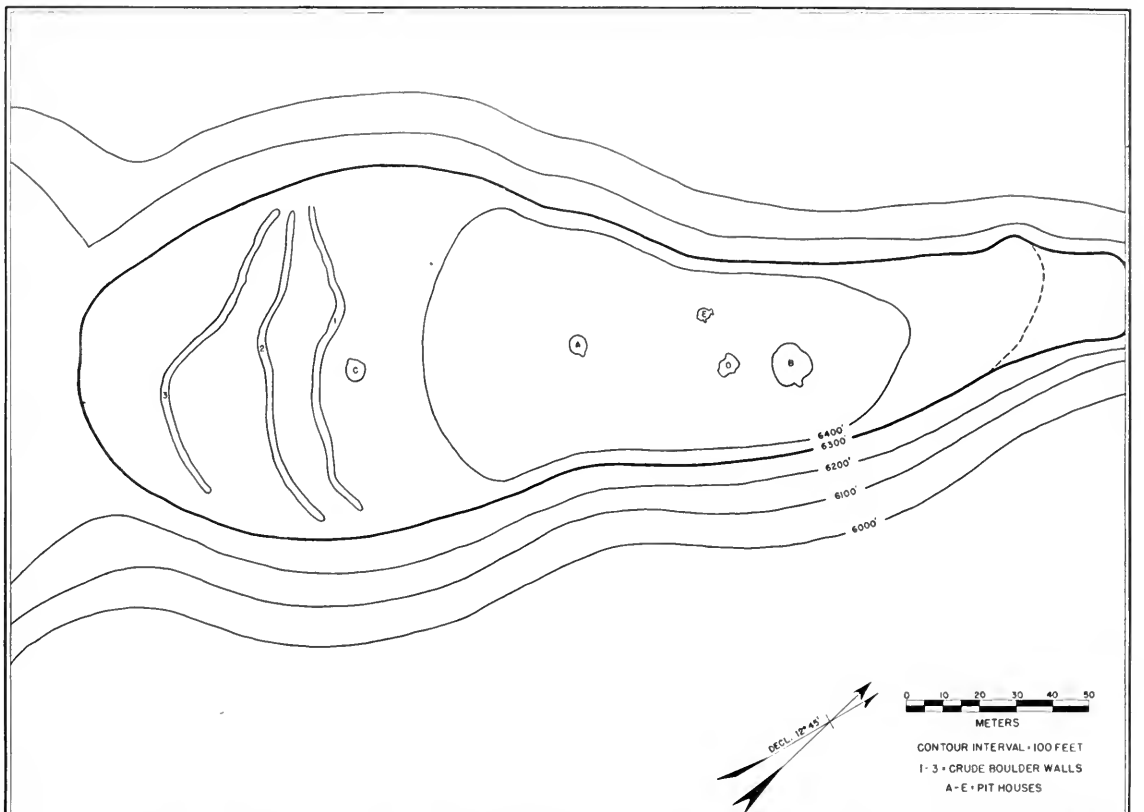


FIG. 21. Map of Promontory site.

VI. DESCRIPTION OF ARCHITECTURAL DETAILS

PINE LAWN PHASE: PROMONTORY SITE

(Fig. 21)

PIT-HOUSE A

(Figs. 22, 23)

Shape.—Roughly circular; greatest diameter, 5.5 meters.

Walls of unplastered, reddish-yellow clay.

Floor of gravelly, orange-colored clay; uneven and rocky; depth below present ground level, 30 to 35 cm.

Firepit.—Roughly oval; lined with rocks; more or less in center of house; 1.45 meters by 75 cm. and 40 cm. deep.

Lateral Entrance.—On east side; short and roughly circular.

Pits.—One in number; 1 by 1.5 meters, and 25 cm. deep; walls and floor of gravelly, orange clay; no burials or artifacts found therein.

Postholes.—One; diameter, 20 cm.; depth, 10 cm. From impressions on burned clay, it is evident that beams, poles, and adobe were used. Exact arrangement of beams and support thereof not known.

Roof.—Exact character unknown.

Pottery.—Floor level: Alma Plain, Alma Rough, and San Francisco Red, Saliz variety (see POTTERY, chap. VIII, for details).

Phase.—Pine Lawn.

General Comments.—This house burned. In wall just above pit, one whole Alma Plain jar and one-half Alma Plain bowl were found. Three manos on floor, one near a flat slab.

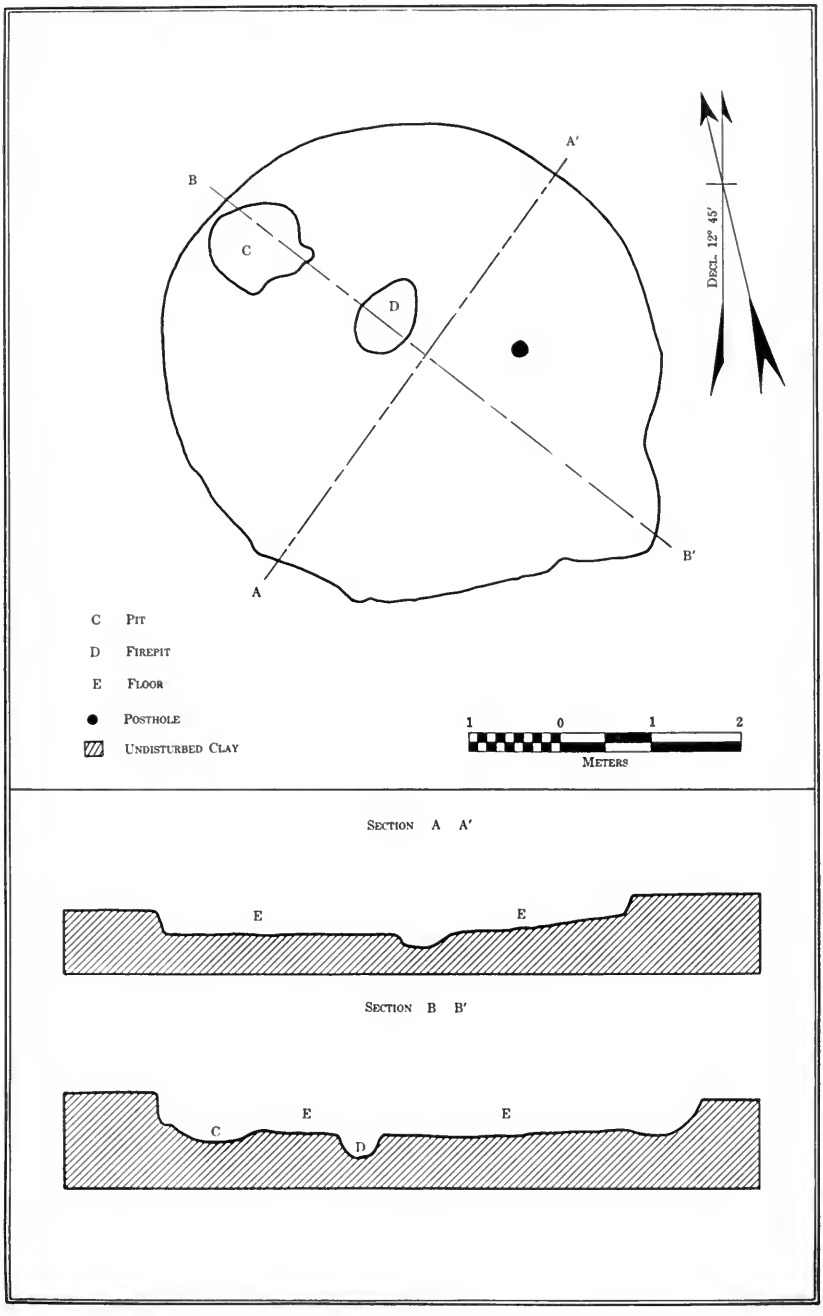


FIG. 22. Plan and sections of Pit-house A, Promontory site.

FIG. 23. Pit-house A, Promontory site. Arrow (50 cm. long) points north; meter stick in background.

PINE LAWN PHASE: PROMONTORY SITE

PIT-HOUSE B

(Figs. 24, 25)

This house was only partly excavated. A trench was dug across the diameter and around the periphery.

Shape.—Kidney shape; greatest diameter, 11 meters.

Walls of gravelly earth in places, bedrock (lava) in others.

Floor of pinkish-yellow clay; uneven; depth below present ground level, 70 to 75 cm.

Lateral Entrance.—Center of northeast wall; short and stubby.

Pottery.—Floor level: Alma Plain, Alma Rough, and San Francisco Red, Saliz variety (see POTTERY, chap. VIII, for details).

Phase.—Pine Lawn.

General Comments.—This house probably did not burn. Several artifacts were encountered in the trenches: manos, metate, boulder mortar, pebble mortar, multifaced pestle (see ARTIFACTS, chap. VII, for details). In plan, size and shape, this pit-house bears a striking resemblance to Pit-house A at the SU site (Martin, 1940).

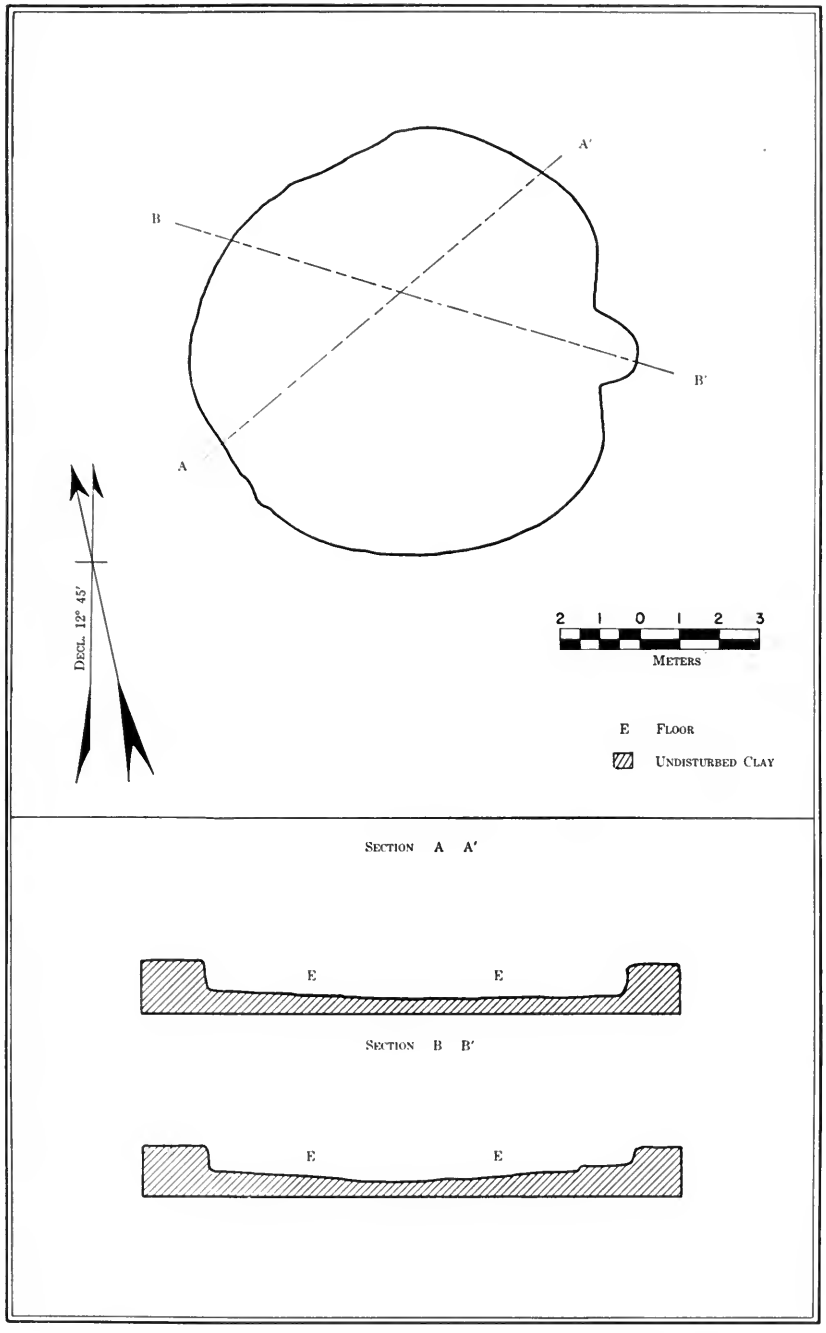


FIG. 24. Plan and sections of Pit-house B, Promontory site.

FIG. 25. Pit-house B, Promontory site. Arrow (50 cm. long) points north; meter stick in background.

PINE LAWN PHASE: PROMONTORY SITE

PIT-HOUSE C

(Figs. 26, 27)

Shape.—Roughly circular; greatest diameter, 5.8 meters.

Walls of unplastered, dark red clay.

Floor of gravelly, orange-colored clay; very uneven and rocky; depth below present ground level, 20 to 25 cm.

Lateral Entrance.—None found.

Pits.—Three in number; least diameter, 50 cm.; greatest diameter, 1 meter; least depth, 20 cm.; greatest depth, 30 cm.

Postholes.—One(?); diameter, 15 cm.; depth, 10 cm.

Roof.—Made of beams, poles or splints, and clay (this evidence from burned adobe). Exact arrangement of these parts is not known.

Pottery.—Floor level: Alma Plain, Alma Rough, and San Francisco Red, Saliz variety (see POTTERY, chap. VIII, for details).

Phase.—Pine Lawn.

General Comments.—This house burned. A few manos were found in the storage pits.

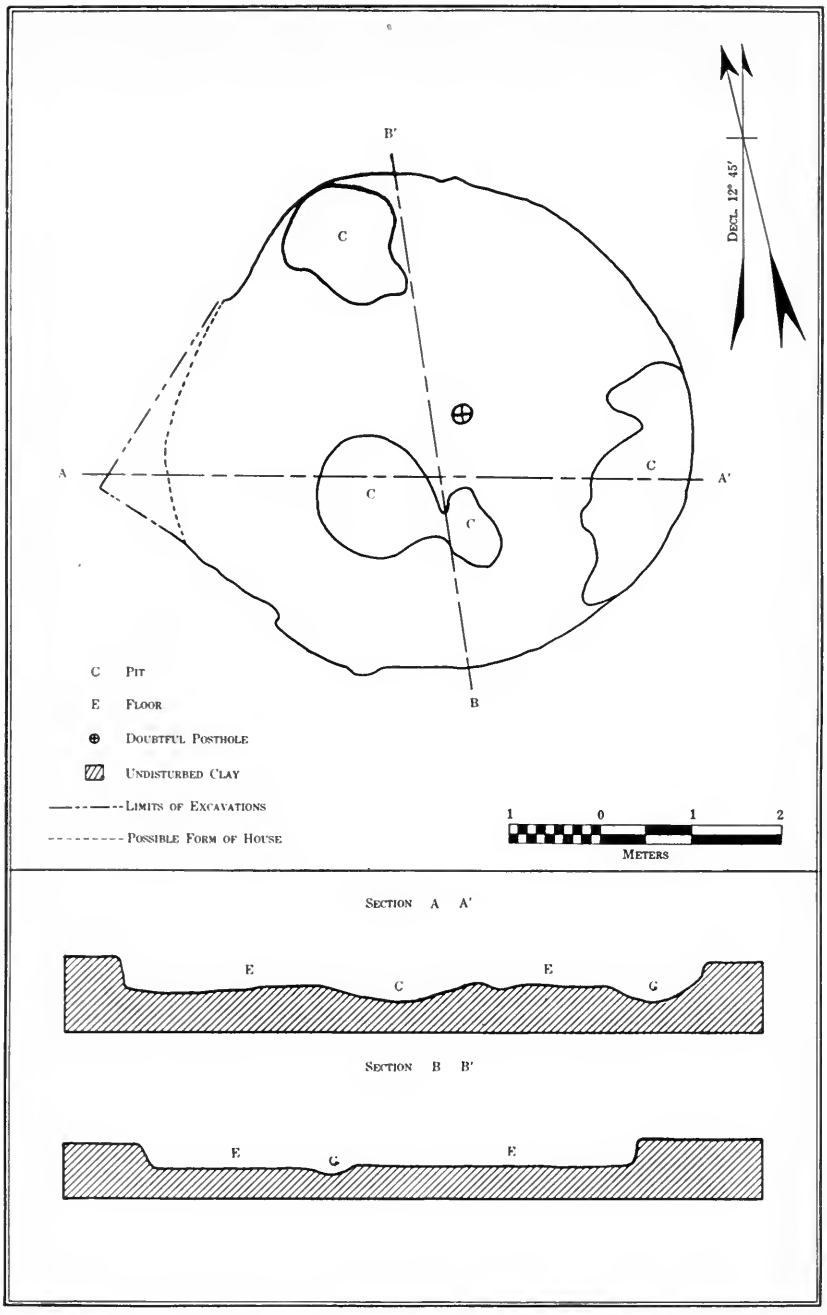


FIG. 26. Plan and sections of Pit-house C, Promontory site.

FIG. 27. Pit-house C, Promontory site. Arrow (50 cm. long) points north; meter stick in background.

PINE LAWN PHASE: PROMONTORY SITE

PIT-HOUSE D

(Figs. 28, 29)

Shape.—Amorphous; greatest diameter, 5.6 meters.

Walls of unplastered, pinkish-yellow clay.

Floor of gravelly earth and rock; uneven; depth below present ground level, 20 to 40 cm.

Firepit.—None found.

Lateral Entrance.—None found.

Pits.—Four in number; least diameter, 0.5 meters; greatest diameter, 1.7 meters; least depth, 25 cm.; greatest depth, 40 cm. Two long, bone awls found in south pit; one mano found in north pit.

Postholes.—Two in number; diameters, 20 and 35 cm.; depths, 8 and 25 cm.

Roof.—Composed of beams, poles, and clay (this evidence from burned adobe). Arrangement of beams unknown.

Pottery.—Floor level: Alma Plain, Alma Rough, and San Francisco Red, Saliz variety (see POTTERY, chap. VIII, for details).

Phase.—Pine Lawn.

General Comments.—This house burned. Irregular shape of house may be significant.

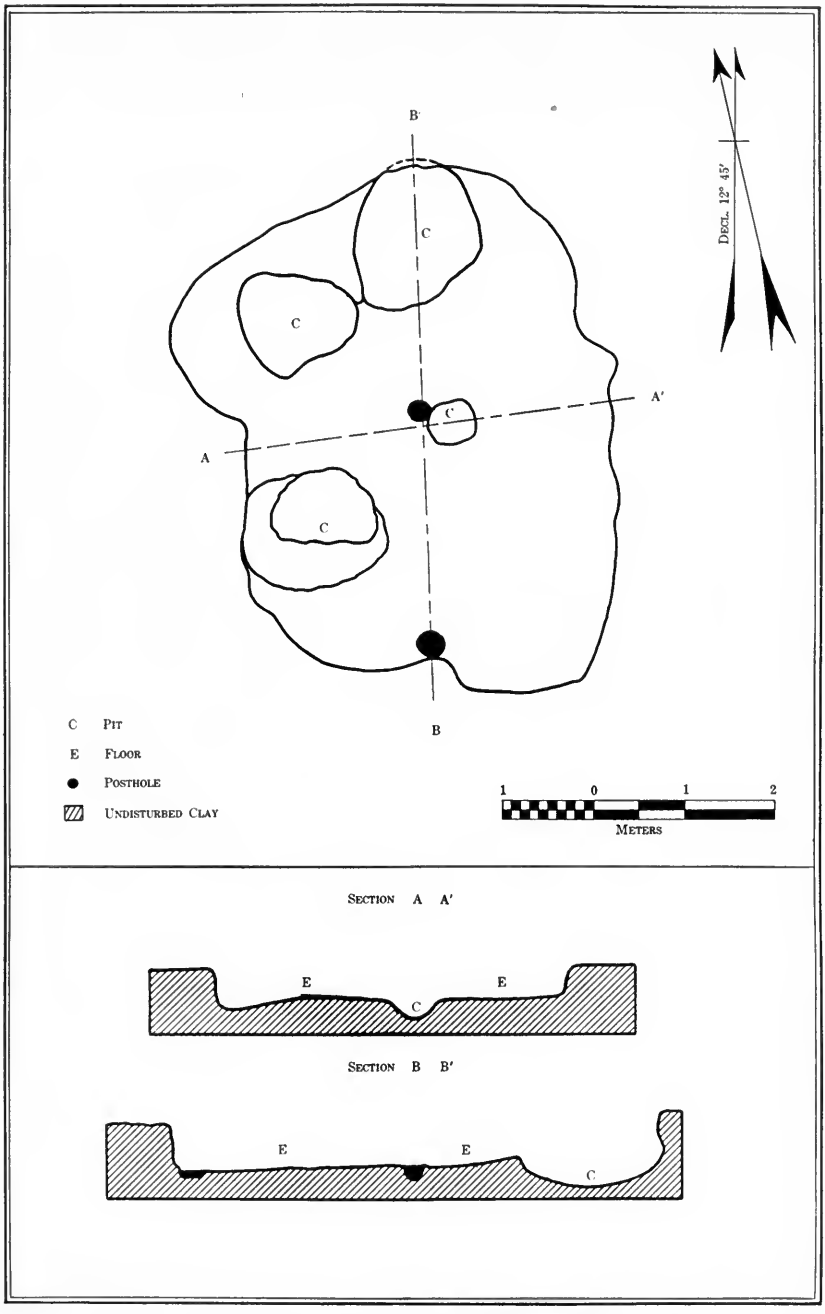


FIG. 28. Plan and sections of Pit-house D, Promontory site.

FIG. 29. Pit-house D, Promontory site. Arrow (50 cm. long) points north; meter stick in background.

PINE LAWN PHASE: PROMONTORY SITE

PIT-HOUSE E

(Figs. 30, 31)

Shape.—Roughly circular; greatest diameter, 3.4 meters.

Walls of unplastered, reddish-yellow clay.

Floor of reddish-yellow clay; uneven; depth below present ground level, 10 to 30 cm.

Lateral Entrance.—On east side; short and narrow.

Pits.—One in number; 1.5 by 1.3 meters; depth, 30 cm.

Postholes.—Two in number; diameters, 8 and 25 cm.; depths, both 10 cm.

Roof.—Exact character unknown.

Pottery.—Floor level: Alma Plain, Alma Rough, and San Francisco Red, Saliz variety (see POTTERY, chap. VIII, for details).

Phase.—Pine Lawn.

General Comments.—This house did not burn. On north side of house is an extra-mural pit containing posthole, with butt of post in it. Diameter of posthole, 35 cm.; depth, 15 cm. Apparently this pit could be entered through house wall, but whether it was covered by the main roof is not known.

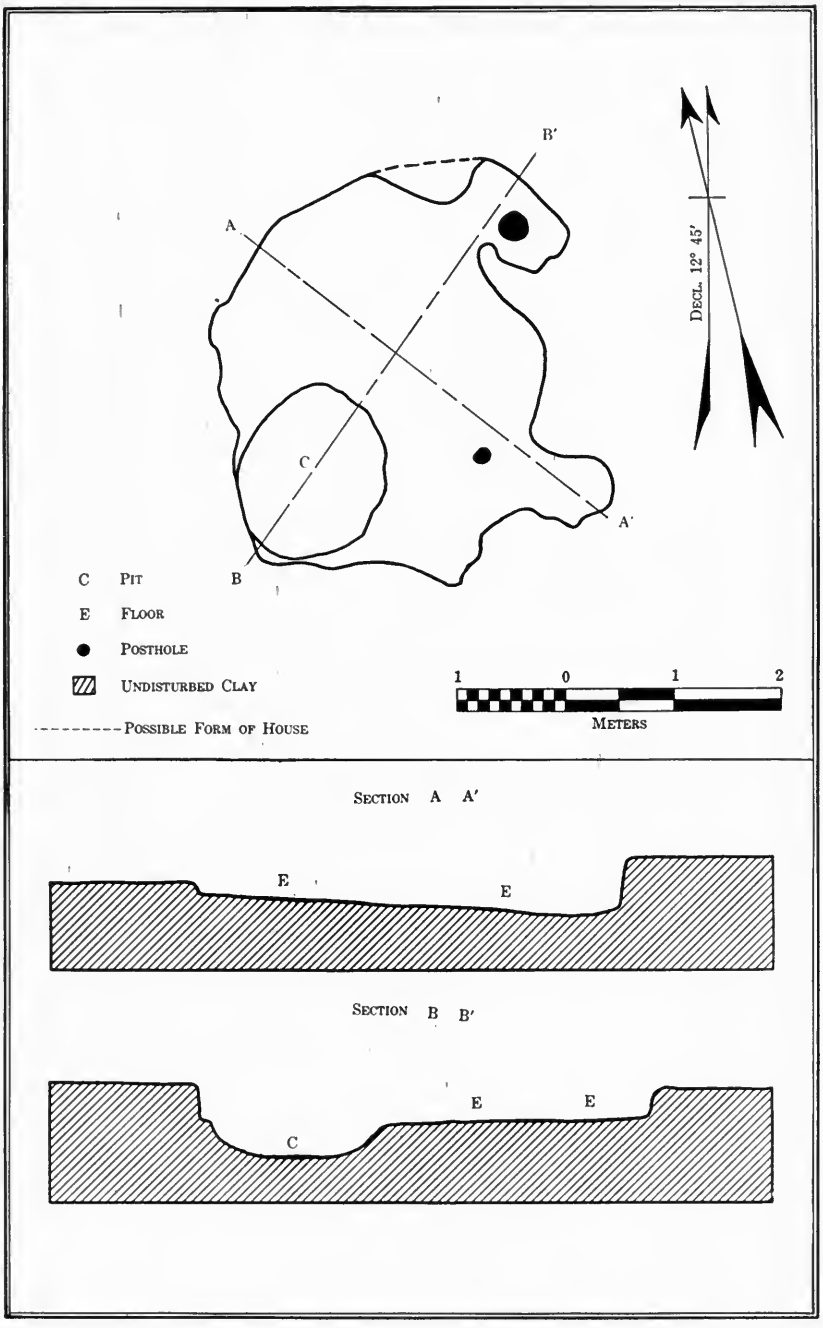


FIG. 30. Plan and sections of Pit-house E, Promontory site.

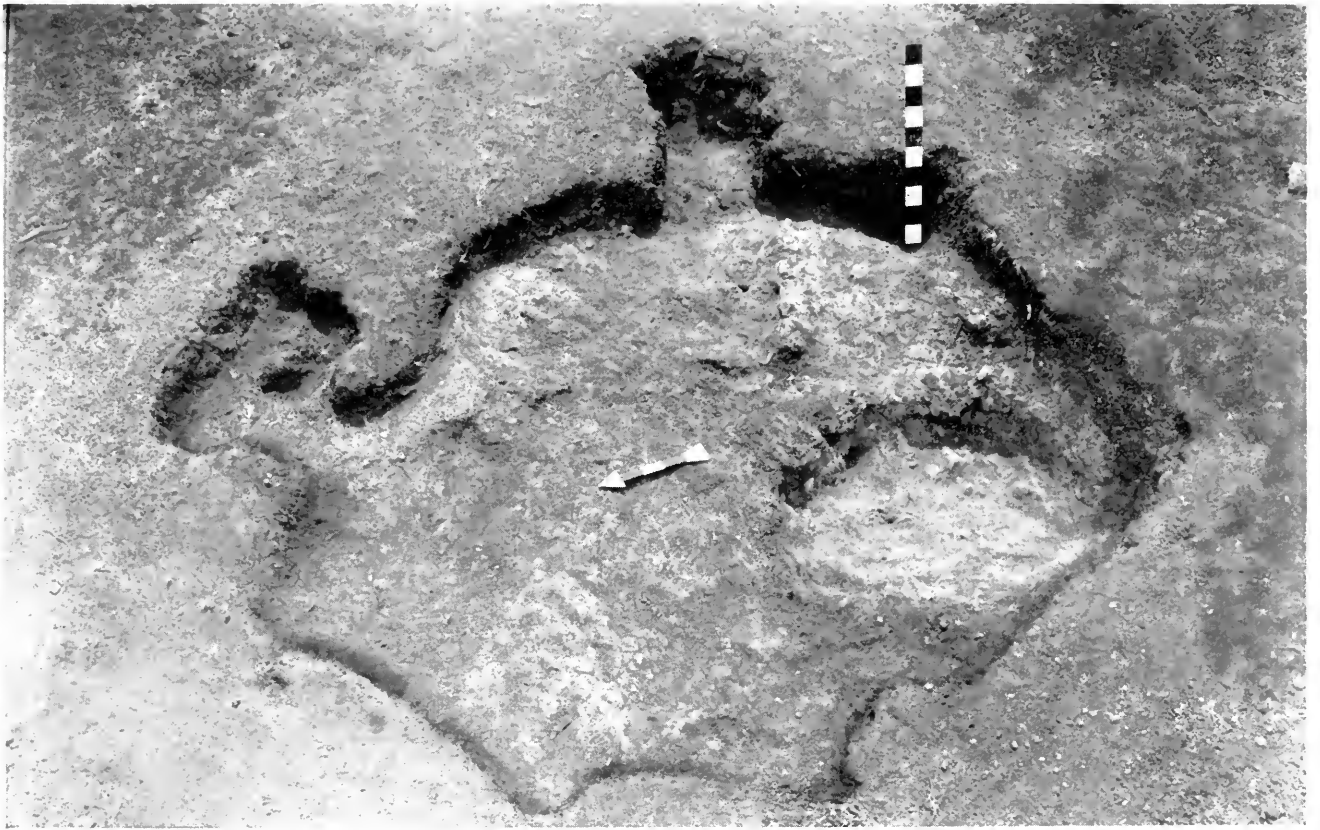


FIG. 31. Pit-house E, Promontory site. Arrow (50 cm. long) points north; meter stick in background.

THREE CIRCLE PHASE: TURKEY FOOT RIDGE SITE

PIT-HOUSE A

(Figs. 32, 33)

Shape.—Rectangular; greatest length, 3.9 meters.

Walls of unplastered, gravelly, orange-colored earth.

Floor of gravelly, yellowish earth; fairly even and smooth; depth below present ground level, 1 meter.

Firepit.—Roughly circular; dimensions, 35 by 30 by 6 cm.; placed near entryway.

Lateral Entrance.—On east side; two postholes in east end.

Pits.—None found.

Postholes.—Nine in number (including two in entryway); least diameter, 10 cm.; greatest diameter, 25 cm.; least depth, 7 cm.; greatest depth, 25 cm.; three across center of room at right angle to axis of doorway.

Roof.—Composed of poles, brush, and clay (this evidence from burned adobe). One large roof beam probably supported by three central posts.

Pottery.—Alma Plain, Alma Rough, San Francisco Red, Saliz variety, Reserve Smudged, Alma Neck Banded, Three Circle Neck Corrugated, Blind Corrugated, Alma Scored, Mogollon Red-on-Brown, Three Circle Red-on-White, Mimbres Bold Face, Mimbres Classic (see POTTERY, chap. VIII, for details).

Phase.—Three Circle.

General Comments.—This house burned. Metate and mano found together near east side of house. Walls of house slope out about 75 cm. above floor, forming a "bench." One posthole found in this "bench" on south wall. Flat "piki" slabs *in situ* near southwest corner of house. Small mano *in situ* near southeast corner of house.

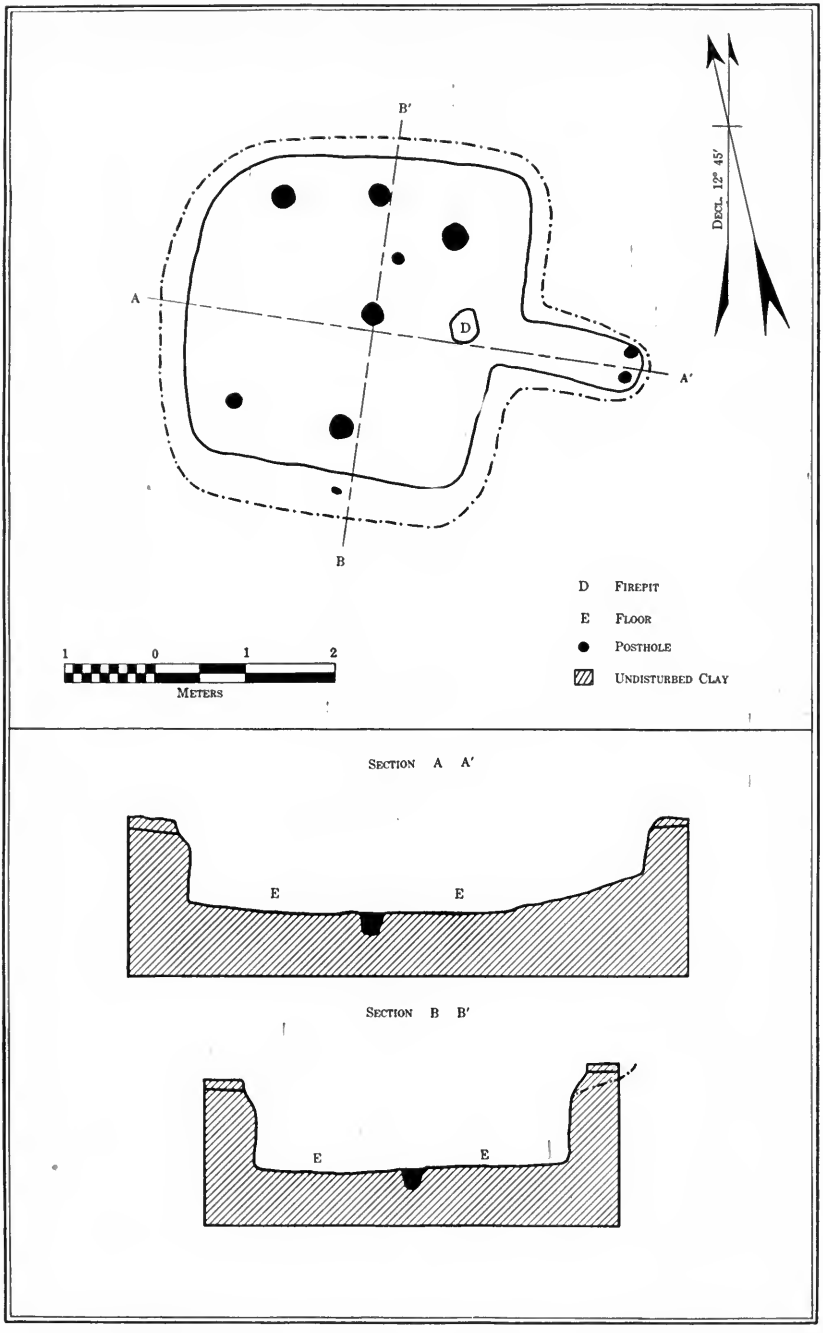


FIG. 32. Plan and sections of Pit-house A, Turkey Foot Ridge site.

FIG. 33. Pit-house A, Turkey Foot Ridge site. Arrow (50 cm. long) points north; meter stick in background.

THREE CIRCLE PHASE: TURKEY FOOT RIDGE SITE

PIT-HOUSE B

(Figs. 34, 35)

Shape.—Roughly circular; greatest diameter, 6.8 meters.

Walls of unplastered, orange clay.

Bench.—Around wall; of native earth; 55 cm. to 1.5 meters wide; 25 to 40 cm. high.

Floor of pinkish-yellow, gravelly earth; very uneven; depth below present ground level, 35 and 80 cm.

Firepit.—None found.

Lateral Entrance.—On east side; very long and irregular in shape. Ridge of clay across entrance where entryway joins house.

Pits.—Four in number; least diameter, 90 cm.; greatest diameter, 1.5 meters; least depth, 8 cm.; greatest depth, 40 cm.

Postholes.—Thirty-three in number; least diameter, 10 cm.; greatest diameter, 35 cm.; least depth, 10 cm.; greatest depth, 40 cm.

Roof.—Composed of beams, poles, and clay (this evidence from burned adobe). Beams probably ran from posts near walls to central posts (on floor, sections of charred beams were found pointed toward center of house).

Pottery.—Floor level: Alma Plain, Alma Rough, San Francisco Red, Saliz variety, Reserve Smudged, San Lorenzo Red-on-Brown, Mogollon Red-on-Brown, Three Circle Red-on-White, Mimbres Bold Face, Mimbres Classic, Red Mesa Black-on-White, Tularosa Black-on-White, Reserve Black-on-White, Indeterminate Black-on-White, Indeterminate Mimbres Black-on-White, Three Circle Neck Corrugated, Alma Neck Banded, Alma Scored, Incised Corrugated (see POTTERY, chap. VIII, for details).

Phase.—Three Circle.

General Comments.—This house burned. Metate and mano *in situ* near north wall; "piki" slabs *in situ* near southwest wall and bench. Several jars near these slabs. Much pottery smashed on floor.

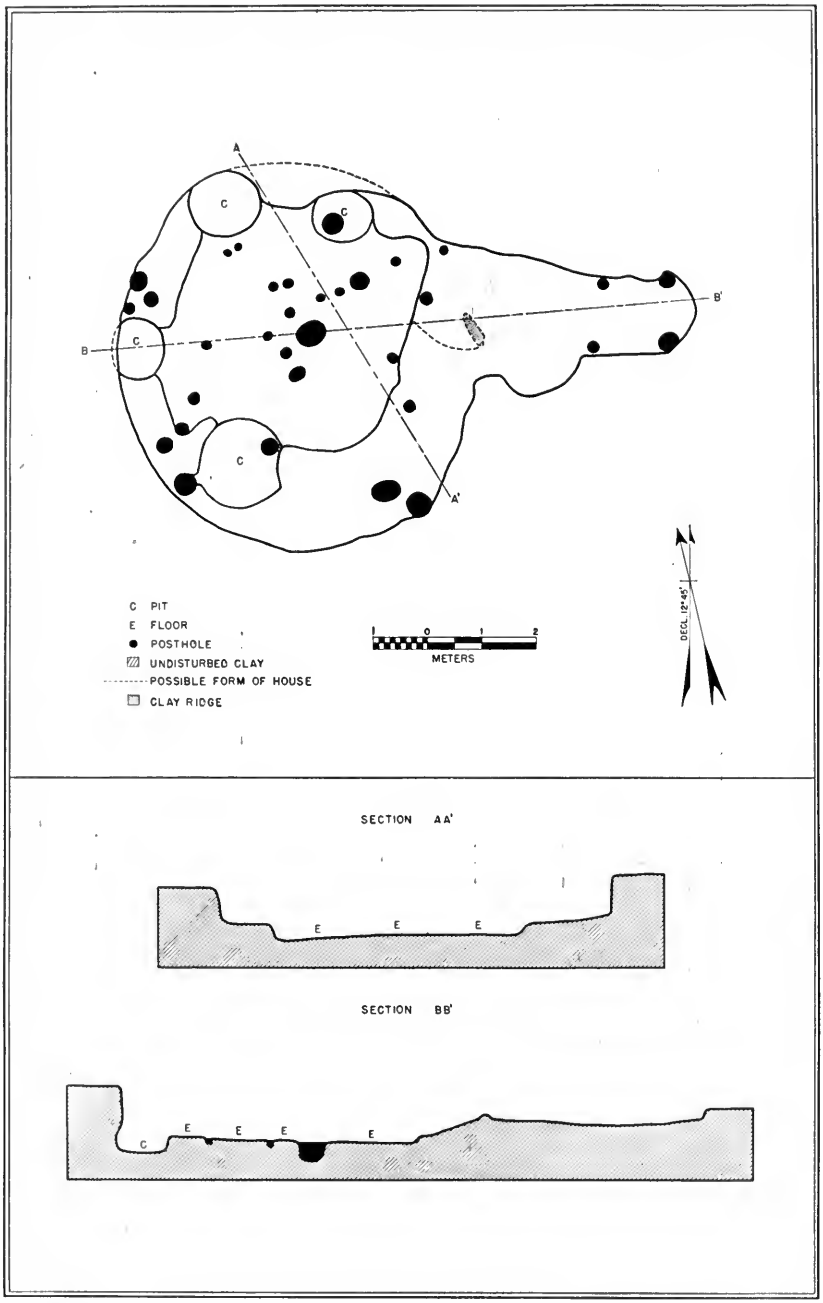


FIG. 34. Plan and sections of Pit-house B, Turkey Foot Ridge site.

FIG. 35. Pit-house B, Turkey Foot Ridge site. Arrow (50 cm. long) points north; meter stick in background.

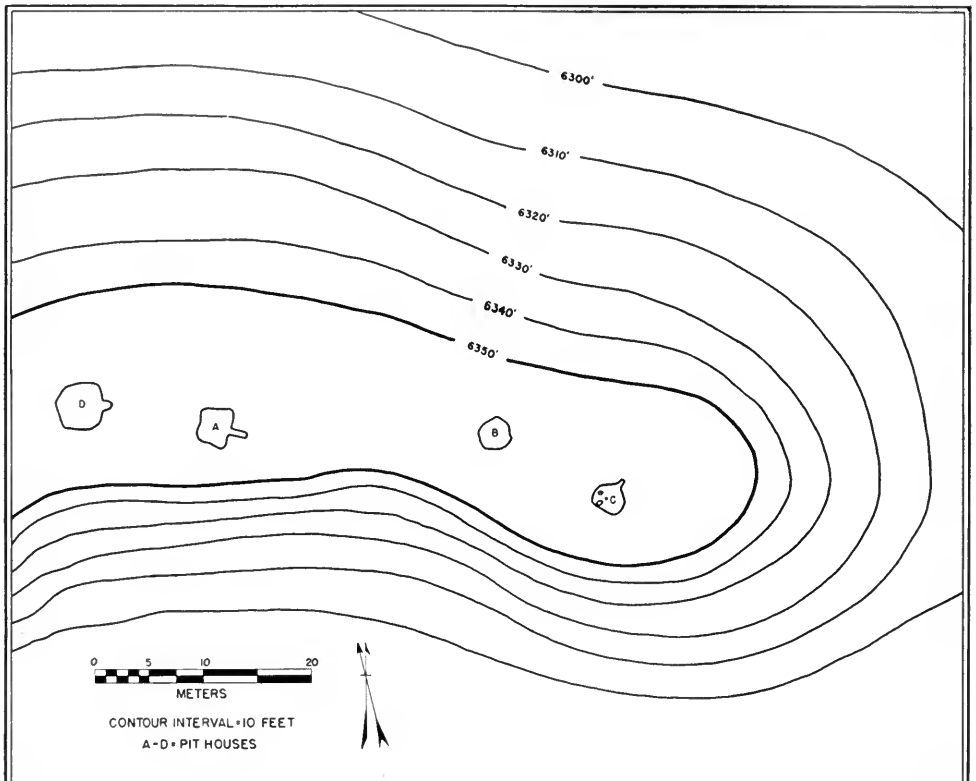


FIG. 36. Map of Twin Bridges site.

THREE CIRCLE PHASE: TWIN BRIDGES SITE

(Fig. 36)

PIT-HOUSE A

(Figs. 37, 38)

Shape.—Rectangular; greatest length, 3.65 meters.

Walls of unplastered, gravelly earth.

Floor of orange-colored, gravelly clay; uneven; depth below present ground level, 60 to 70 cm.

Firepit.—In center of floor; roughly circular; diameter, 30 cm.; depth, 20 cm.

Lateral Entrance.—On east side of house; floor slopes gradually upward toward outer end.

Pits.—None located.

Postholes.—Five in number; diameters range from 15 to 30 cm.; depths from 10 to 20 cm.

Roof.—Exact character unknown.

Pottery.—Alma Plain, Alma Rough, San Francisco Red, Saliz variety, Three Circle Red-on-White, Mimbres Bold Face Black-on-White, Abajo Red-on-Orange, Alma Neck Banded (see POTTERY, chap. VIII, for details).

Phase.—Three Circle.

General Comments.—This house did not burn.

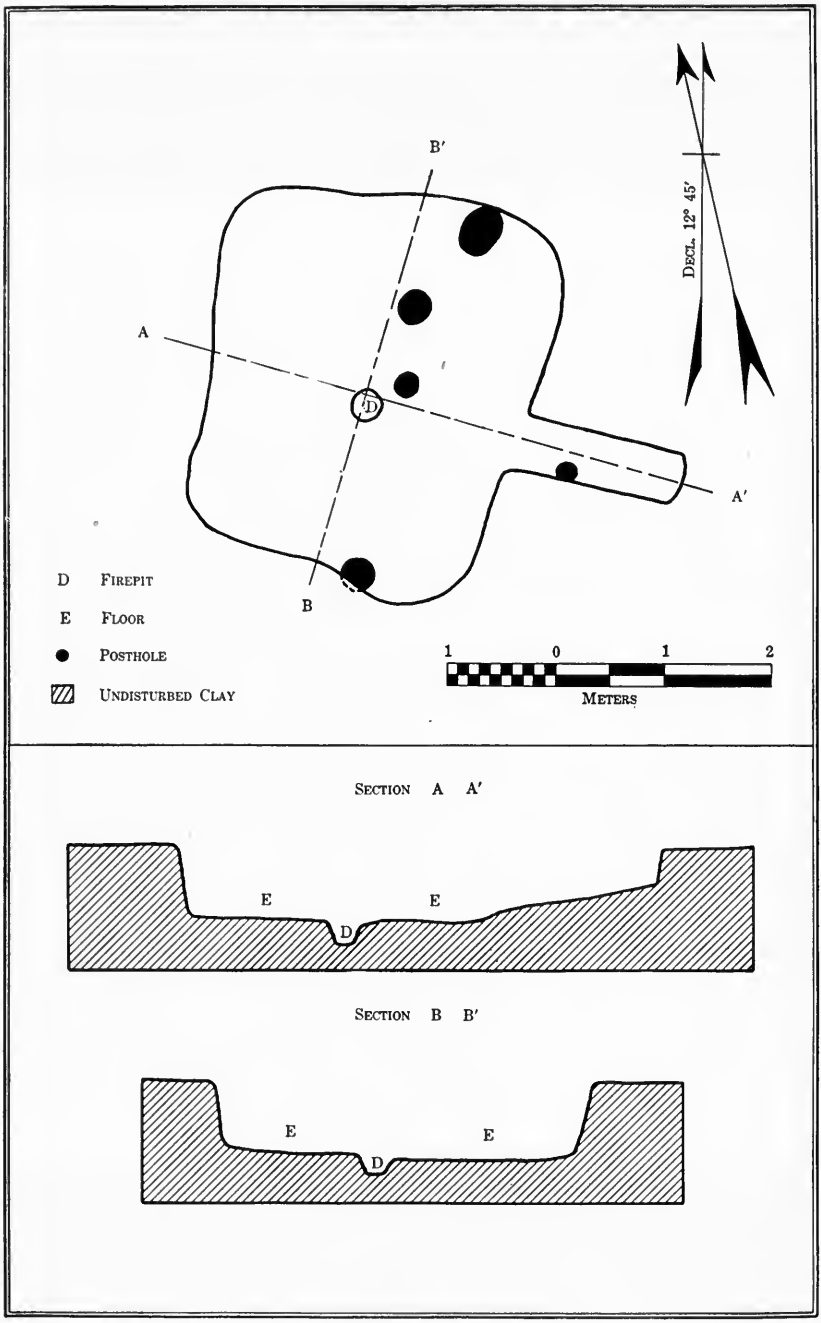


FIG. 37. Plan and sections of Pit-house A, Twin Bridges site.

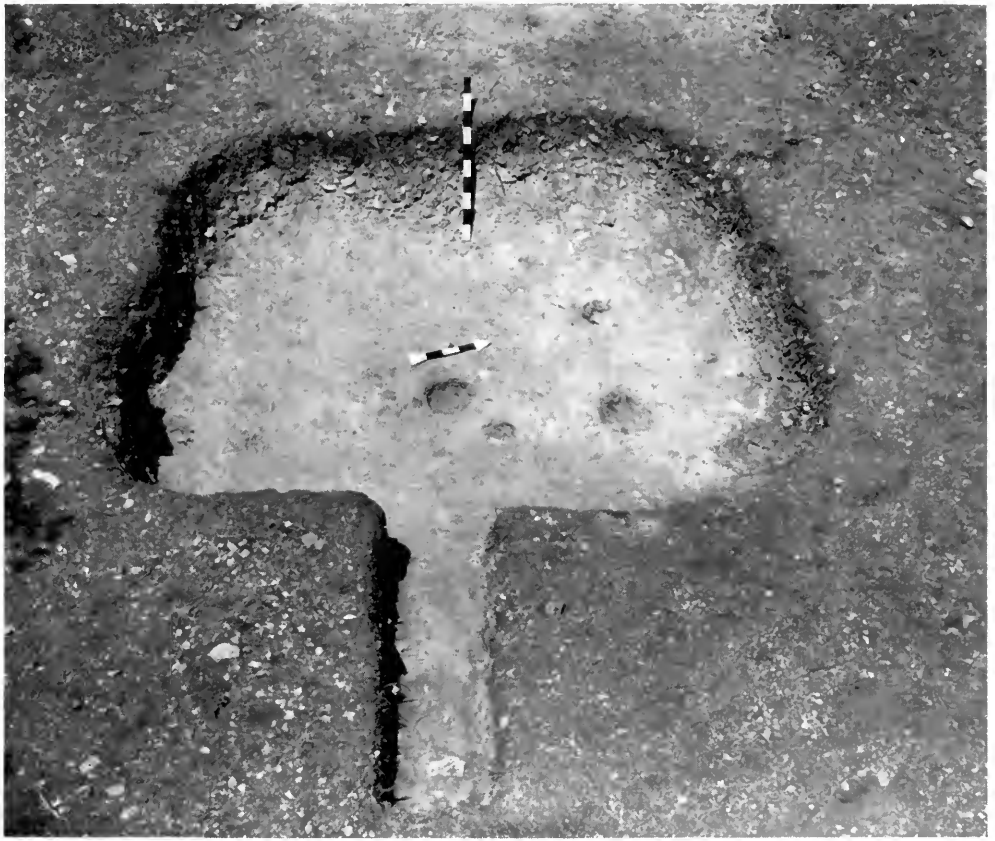


FIG. 38. Pit-house A, Twin Bridges site. Arrow (50 cm. long) points north; meter stick in background.

THREE CIRCLE PHASE: TWIN BRIDGES SITE

PIT-HOUSE B

(Figs. 39, 40)

Shape.—Roughly circular; greatest diameter, 3.15 meters.

Walls of unplastered clay.

Floor of reddish-yellow clay; uneven; depth below present ground level, 20 to 30 cm.

Firepit.—Located in center of floor; diameter, 50 cm.; depth, 5 cm.; lined with rock and clay.

Lateral Entrance.—None found.

Pits.—None found.

Postholes.—None found.

Roof.—Exact character unknown.

Pottery.—Alma Plain, Alma Rough, San Francisco Red, Saliz variety, Alma Neck Banded, Mimbres Bold Face Black-on-White (see POTTERY, chap. VIII, for details).

Phase.—Three Circle.

General Comments.—This house is really a surface house, and it might possibly have been a brush shelter. It did not burn. There was an unusually large amount of charcoal in firepit.

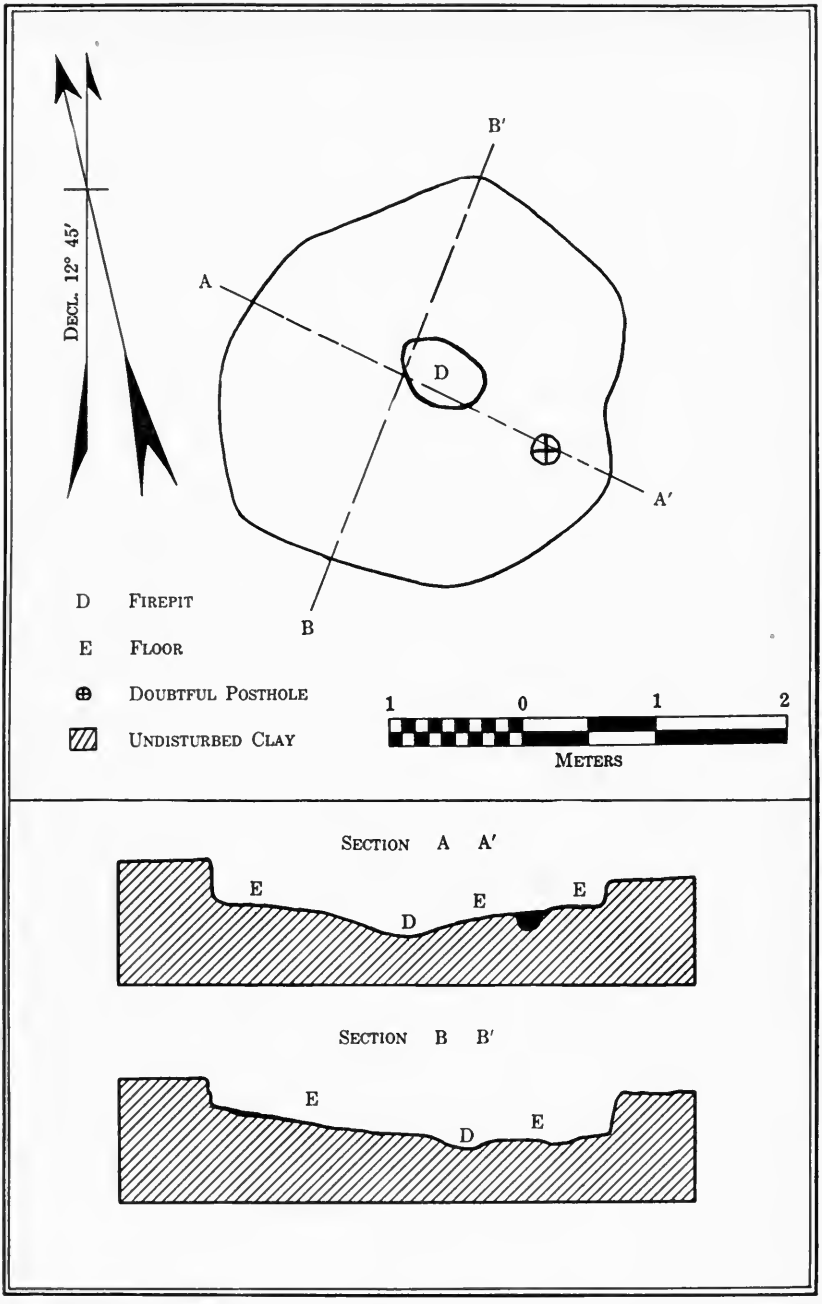


FIG. 39. Plan and sections of Pit-house B, Twin Bridges site.

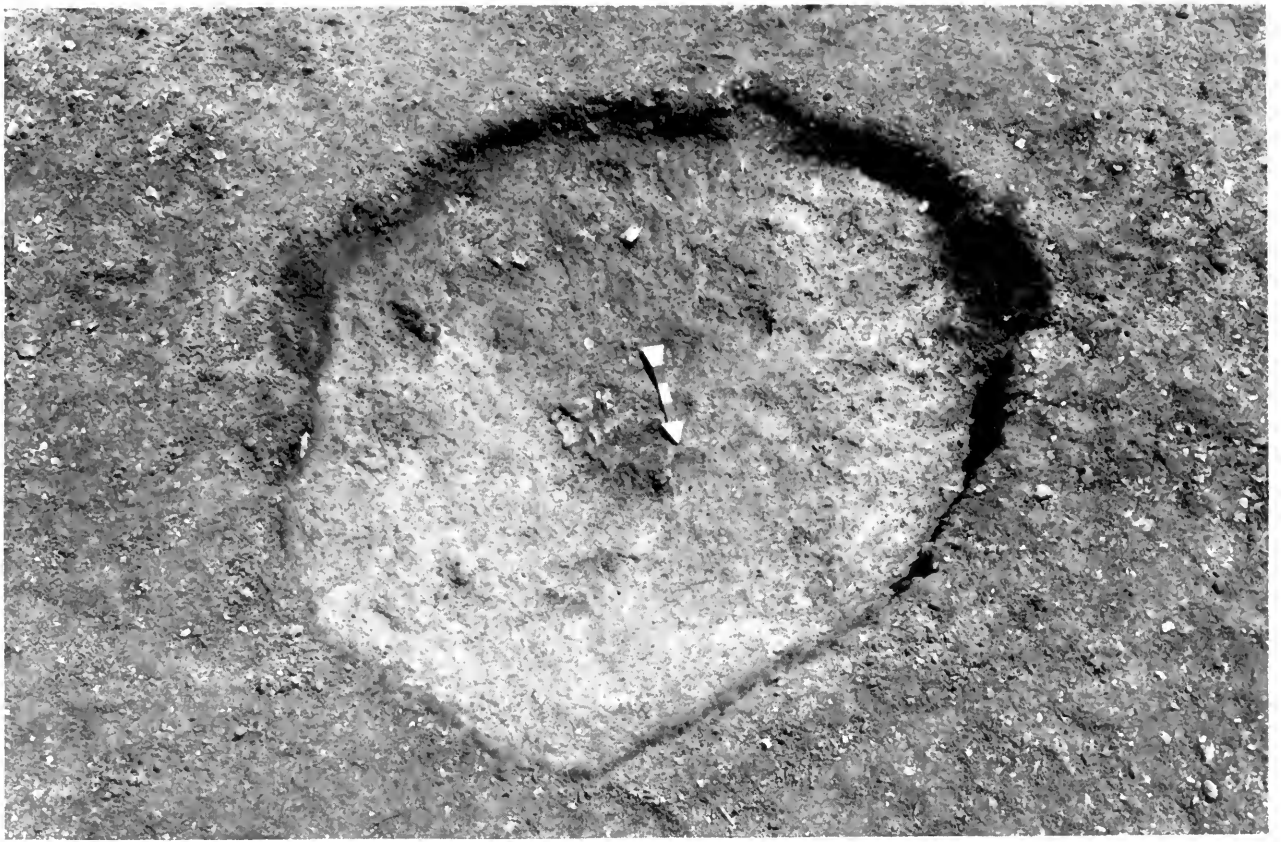


FIG. 40. Pit-house B, Twin Bridges site. Arrow (50 cm. long) points north.

THREE CIRCLE PHASE: TWIN BRIDGES SITE

PIT-HOUSE C

(Figs. 41, 42)

Shape.—Roughly rectangular; greatest length, 3.6 meters.

Walls of unplastered, gravelly earth.

Floor of yellow, gravelly earth; uneven; depth below present ground level, 40 to 70 cm.

Firepit.—Located near wall opposite entryway; diameter, 65 cm.; depth, 10 cm.

Lateral Entrance.—In northeast wall.

Pits.—One in number; 45 cm. in diameter; 10 cm. deep.

Postholes.—None found.

Roof.—Exact character unknown.

Pottery.—Alma Plain, Alma Rough, San Francisco Red, Saliz variety, Reserve Smudged, Alma Neck Banded, Three Circle Red-on-White, Mimbres Bold Face Black-on-White (see POTTERY, chap. VIII, for details).

Phase.—Three Circle.

General Comments.—This house did not burn.

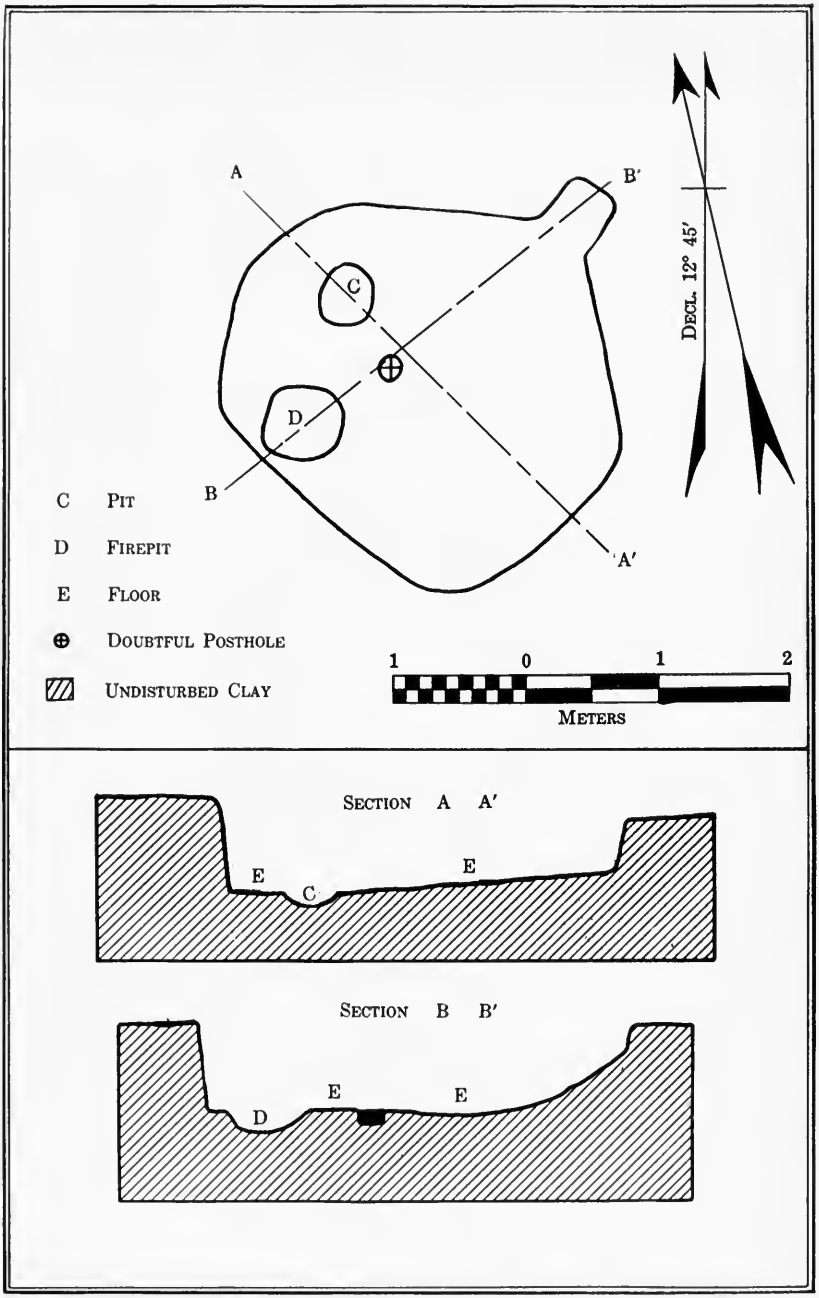


FIG. 41. Plan and sections of Pit-house C, Twin Bridges site.

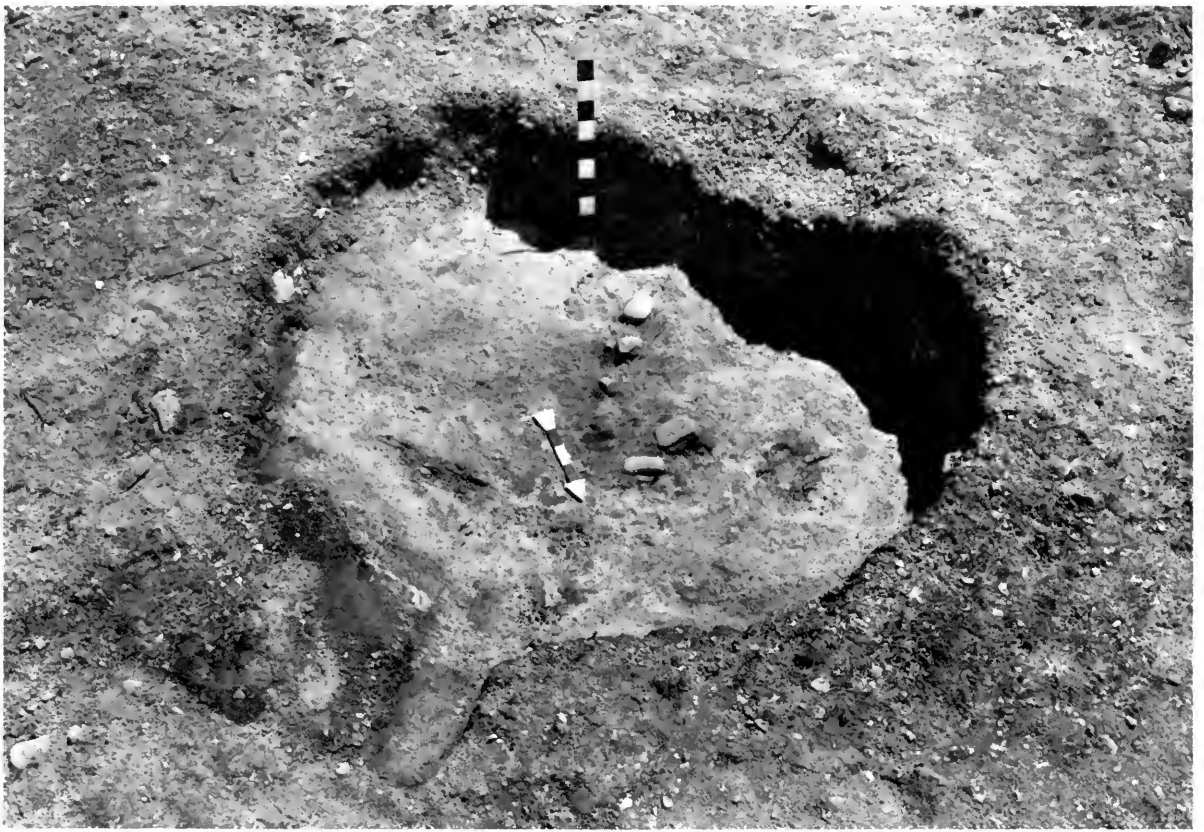


FIG. 42. Pit-house C, Twin Bridges site. Arrow (50 cm. long) points north; meter stick in background.

THREE CIRCLE PHASE: TWIN BRIDGES SITE

PIT-HOUSE D

(Figs. 43, 44)

Shape.—Rectangular; greatest length, 4.5 meters.

Walls of unplastered, yellowish, gravelly earth.

Floor of white and yellowish gravelly earth; fairly even; covered with thin layer of plaster; greatest depth below present ground level, 85 cm. to 1.15 meters.

Firepit.—Near doorway in central axis; dimensions, 30 by 50 cm.; depth, 7 cm.; lined with whitish, gravelly earth.

Lateral Entrance.—On east wall of house; short and irregular in outline.

Pits.—None located.

Postholes.—Six in number; least diameter, 15 cm.; greatest diameter, 55 cm.; least depth, 10 cm.; greatest depth, 30 cm.

Roof.—Composed of beams, small poles, brush, and clay (this evidence from burned adobe); arrangement of beams and upright supports probably similar to postulated reconstruction given by Haury (1936a, fig. 26, *c*).

Pottery.—Alma Plain, Alma Rough, San Francisco Red, Saliz variety, Alma Neck Banded, Three Circle Red-on-White, Mimbres Bold Face Black-on-White, Unclassified Black-on-Red (see POTTERY, chap. VIII, for details).

Phase.—Three Circle.

General Comments.—This house burned. Metate and mano still *in situ* near south side of house with mano in trough of metate.

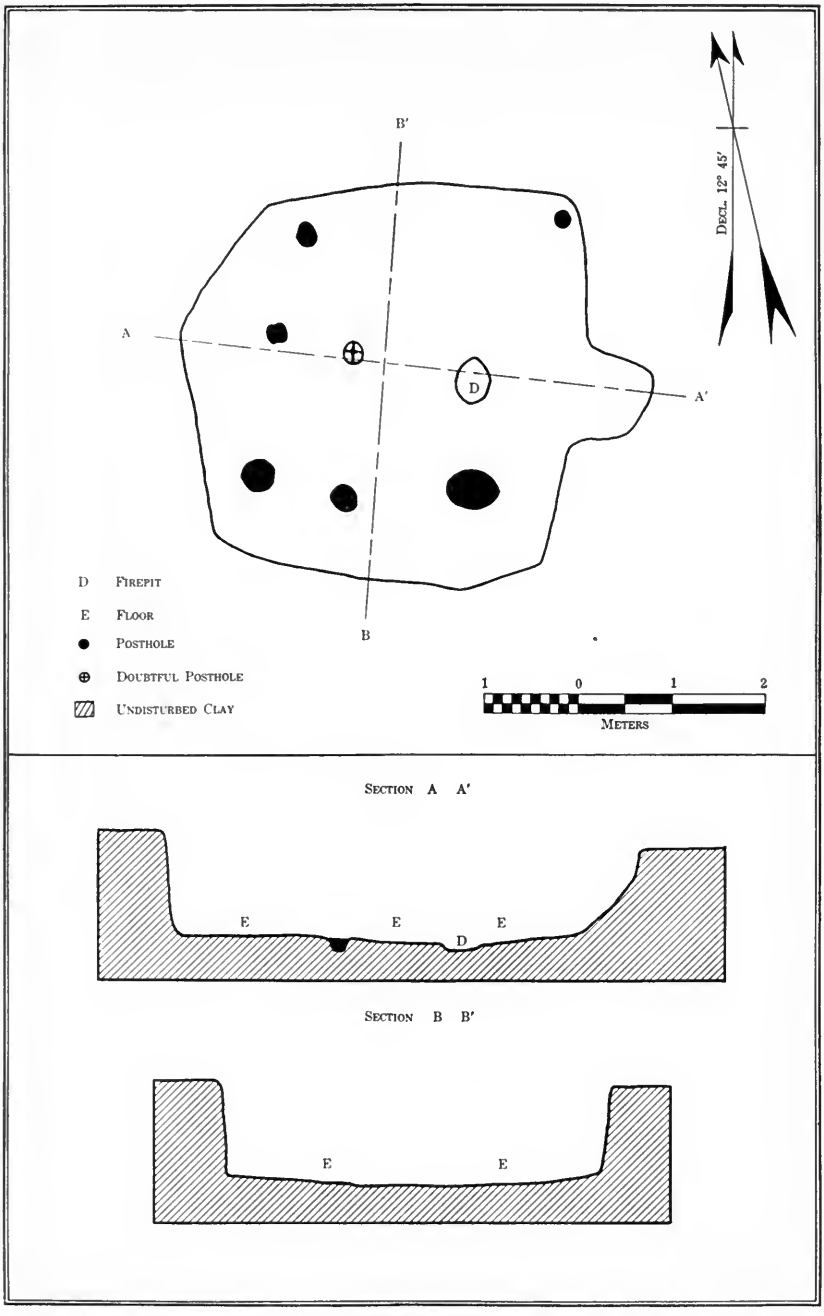


FIG. 43. Plan and sections of Pit-house D, Twin Bridges site.

FIG. 44. Pit-house D, Twin Bridges site.

RESERVE PHASE

OAK SPRINGS PUEBLO

(Figs. 1, 45, 46, 47)

Shape.—L-shaped.

Number of Rooms.—Seven; all contiguous.

Number of Stories.—One.

Walls of crude masonry made up of selected, unshaped boulders of assorted sizes. Stones range in length from 5 to 40 cm. Greatest height of still-standing walls, 55 cm.; base of walls 50 cm. below present ground level, and 23 cm. below old ground level.

Floors of gravelly, orange clay; fairly even; depth below present ground level, 50 cm. Note that floor levels were semi-subterranean. Floors slope toward arroyo.

Firepits.—None.

Entrances.—One interior doorway between rooms A and B; no exterior lateral doorways found.

Pits.—None located.

Burials.—Nos. 1, 2, and 3, *on floor* of Room B (not in pits); all in flexed position on back. Fragment of slab found with No. 1; Reserve Smudged bowl found with No. 2; nothing found with No. 3.

Postholes.—None found.

Roof.—Exact character unknown. Beams possibly supported by walls.

Pottery.—Relatively scarce. Alma Plain, Textured, Reserve Smudged, San Francisco Red, Saliz variety, Mimbres Bold Face, Reserve Black-on-White, and Smudged Decorated.

Phase.—Reserve.

General Comments.—This pueblo did not burn. Excavations below floor level revealed nothing but sterile, gravelly clay. Rooms of unequal size. This pueblo may represent an early stage in surface house development. Rooms were really shallow rectangular or square pits lined with masonry that also rose well above ground level. No kiva found, although extensive trenching was carried on adjacent to rooms.

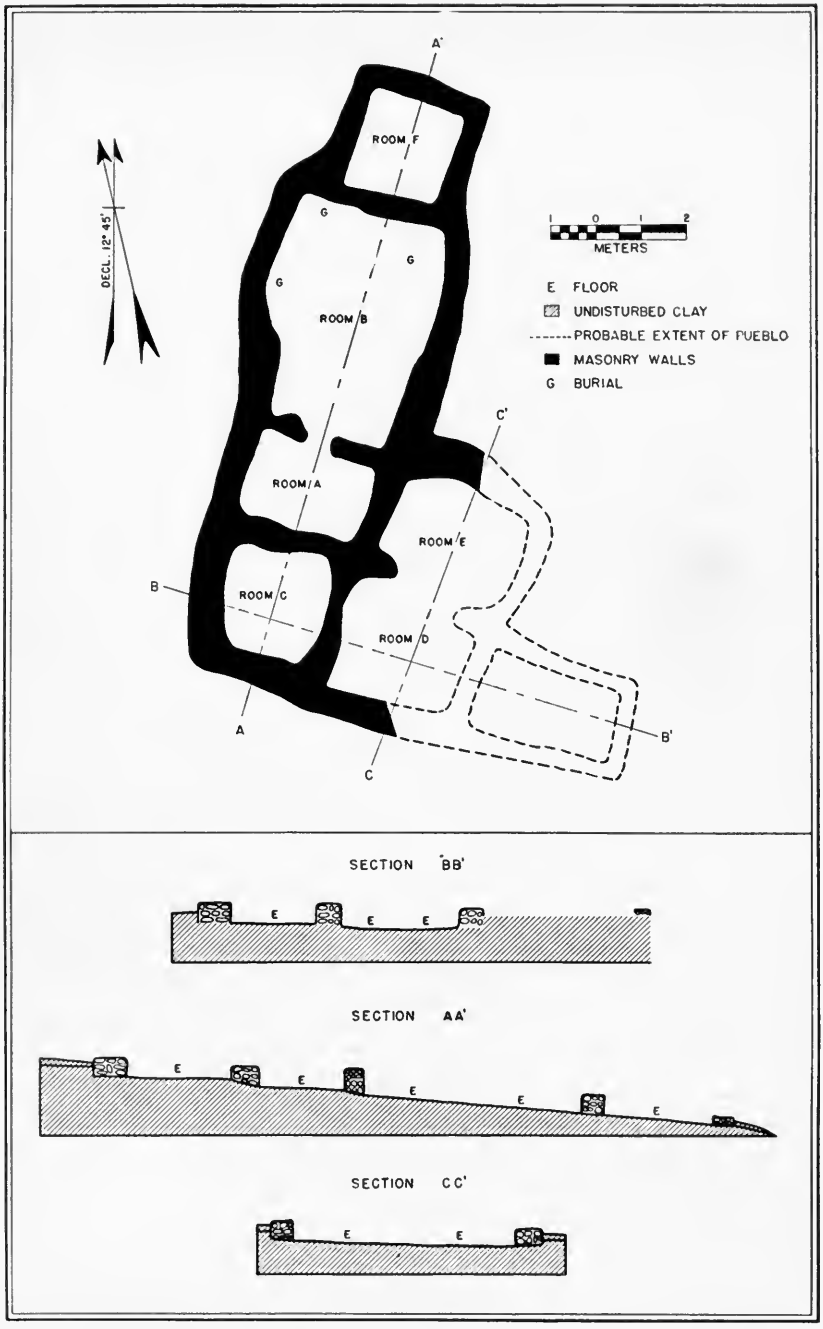


FIG. 45. Plan and sections of Oak Springs Pueblo.

FIG. 46. Oak Springs Pueblo, looking north at Rooms A, B, C, and F. Arrow (50 cm. long) points north; meter stick in background.

FIG. 47. Oak Springs Pueblo, showing details of masonry and doorway between Rooms A and B. Arrow (50 cm. long) points north; meter stick in background.

VII. ARTIFACTS

On pages 143–183 the details of the artifacts are given in outline form. For convenience in comparison, the artifacts have been grouped as follows:[1]

LIST OF ARTIFACTS

Object	Number excavated
Ground and Pecked Stone	
Handstones	
Manos	86
Rubbing stones	27
Pestles	8
Milling stones	
Metates	20
Small, metate-like grinding stones	5
Mortars	2
Worked slabs	6
Polishing stones	62
Hammerstones	7
Stone dishes	2
Abrading stone	1
Pipes	3
Chipped Stone	
Projectile points	7
Knives	68
Scrapers	147
Choppers	4
Drills	5
Hoes	2
Shell	
Bracelet	1
Bone	
Awls	2
Die	1
Clay	
Worked sherds	20
Animal effigy	1
Total number of artifacts	487

DISCUSSION

One of the major fields of inquiry in the study of the houses, pottery, and artifacts excavated in the Pine Lawn Valley was that

[1] Based on field catalogue kept by Mary Allee.

of changes in the Mogollon culture. As manifested in the artifacts, this field of interest was divided into three sectors: (1) the stability of the methods of manufacture; (2) the lack of profound change in the functions of the artifacts; (3) a comparison of the forms of the artifacts with those of various horizons both within and outside of the Pine Lawn Valley, to discover the changes that had taken place in the forms of the artifacts through time and to find the influence of trade or diffusion in bringing about these changes.

METHODS OF MANUFACTURE

A comparison of the stone and bone tools from our excavations in the Pine Lawn Valley reveals a remarkable similarity in the methods of manufacture of artifacts from both early and late sites in all parts of the valley. The two principal methods of working stone were (1) pecking and grinding, (2) chipping. A minor amount of polishing was also done. Bone tools were split, cut, sawed, ground, and polished into the desired shapes. Clay artifacts were molded and polished when wet, baked in the fire (and probably in the sun), and occasionally scraped and ground into shape.

Ground and Pecked Stone Tools

In general, we found more ground and pecked than chipped stone tools. In the choice between these two methods of manufacture the nature of the available materials was apparently not a strictly limiting factor, because on occasion even basalt, a very difficult material to work, was chipped. The principal varieties of ground and pecked stone tools are manos, rubbing stones, pestles, metates and mortars, polishing stones, and pipes.

The usual small pits and striations, the smooth and semipolished surfaces—indeed all the marks that are characteristic of these methods of manufacture—are to be found on artifacts of this category. However, some implements show less evidence of modification of this sort than others. For example, it was characteristic that the oval or round manos with single grinding surfaces were altered only on the grinding surfaces by pecking and grinding. The edges and upper surfaces of such implements were left rough or smooth, whichever way they were found in their natural state. It is apparent from the fact that there is a fair degree of uniformity in the shapes of such stones that they were chosen because they happened to conform to certain suitable (and possibly culturally determined) shapes in their natural state.

Other types of manos and rubbing stones, particularly the rectangular or tabular forms with two grinding surfaces, manifest the other extremes in workmanship. These are more symmetrical in shape, and both the edges and grinding surfaces show the little crater-like pits that are the result of pecking with a hammerstone. Most of the original crust or patina of such stones has been removed.

Like the majority of manos with single grinding surfaces, the metates show marks of having been worked only on their grinding surfaces. The same is true of all the metates, whether they are basin, trough, or slab types; only the basins, troughs, or grinding surfaces of each were modified. The bottom surfaces of such implements were characteristically rough and irregular.

In this feature the mortars are also like the metates; for they too were unaltered except for the cup-shaped depression in one face of the naturally rough, round pebbles from which they were made.

The least altered of all these ground and pecked stone tools are the small natural pebbles that were used as polishing stones. These show no preliminary modification whatsoever and indicate that very little discrimination was used in their selection except on the basis of size. The facets produced by use were the only alterations made in these tools.

At the other extreme, on the basis of workmanship, are the pipes and mauls. The best of these implements were shaped on all of their surfaces by pecking and grinding. Most of them are symmetrical and some have smooth surfaces.

Chipped Stone Tools

Characteristic chipped stone tools are projectile points, knives, scrapers, drills, and choppers. Many of the knives, scrapers, and choppers were little more than utilized flakes and cores. The scrapers are frequently merely thick flakes with the edges sharpened by a slight retouch, and the random flake knives were similarly fashioned of thinner flakes. These knives grade in degree of workmanship from utilized flakes into blades that show secondary chipping on all major surfaces. As might be expected, there is a wide variation on each horizon in the quality of the chipping. Furthermore, there is no noticeable improvement in chipping between the Pine Lawn phase projectile points and those from Three Circle phase houses. Although a number of the chipped stone artifacts show the finest of pressure flaking, a less refined percussion chipping appears to be more characteristic of the general run of chipped stone

tools. The hoes, like many other tools, show little modification from their natural state. They were fashioned from fairly thin natural plates of stone and are shaped only in outline by a rather coarse percussion chipping. Bone and antler flakers and hammerstones such as were found on the SU site were probably the tools used in the manufacture of the chipped stone artifacts.

Worked Shell

The shell artifacts such as bracelets show only one process of shaping—cutting or sawing, it is not clear which. The bracelets were cut from sections of shell of *Glycimeris*, a bivalve. The cut surfaces are smooth and straight, revealing a high standard of workmanship.

Bone Tools

Many of the bone implements show relatively deep diagonal scratches, striations, and grooves, such as would be made by cutting with a rather rough tool. Other surfaces, such as the edges of the dice and the tips of the awls, are smooth and polished. The awls were made of long bones (usually deer metacarpals) split lengthwise into halves or quarters. There are no marks left on the bones from this process to indicate how the splitting was done. After the bones had been split they were cut to the desired shape, as indicated by the scratches mentioned above and by the character of the notches on the notched bone awls. After they had been trimmed, their tips were ground down to a point on some abrasive stone such as sandstone or coarse-grained quartzite. Abrasive stones such as these were found at the SU and Promontory sites (see Martin, 1940, fig. 28, and this report, fig. 61). Possibly they were then polished by the use of a finer abrasive mixed with water and applied with a leather pad.

Clay Artifacts

The clay artifacts were probably made from the local clay, such as can be found on every one of the sites excavated. This could have been obtained either from the pit-house excavations or from gulley exposures. Experimental pottery vessels made from such clays bear a close resemblance to the plain pottery types found on the sites, and more detailed technical comparison of local clays and the local pottery confirms this theory (see Martin, 1943, pp. 240–246). After grinding and the addition of the tempering materials (crushed rock) and water, the wet clays were modeled with the

fingers, as is evident from finger prints on some of the artifacts. The worked sherds and the animal effigy are all of red or brown oxidized wares fired in an open fire. The smooth edges of the worked sherds show that they were shaped by grinding. Possibly this was done by rubbing the edge of one sherd against the edge of another. The holes in the sherds that were perforated were possibly made with a stone drill. Experimental use of the stone drill on the native pottery types indicates that it would be an adequate tool for the purpose.

FUNCTIONS OF ARTIFACTS

A number of the artifacts show characteristic features and marks that tend to corroborate the concepts we have as to their use gained from the use of similar artifacts among historic groups. A few such characteristic indications of use are polished surfaces, striations, battered surfaces, facets, and beveled surfaces.

In this regard the milling stones are the most interesting. The basin metates, for example, show on their grinding surfaces circular striations or polished oval areas which indicate that the manos were used with a rotary motion in the process of grinding on these metates. We have reason to believe that oval manos were used on the basin metates because manos of that shape are most numerous in houses that had such metates. Similar oval grinding surfaces and striations are to be found on the shallow basin metates and some of the slab metates, indicating a similar use of the mano with those types. The oval manos with convex grinding surfaces fit best in the concave grinding surfaces of the deep basin metates. Those with flat grinding surfaces are not quite so suitable for use on such metates and could be used with greater efficiency on the shallow basin and slab types. Moreover, the troughed metates frequently have striations that run lengthwise of the trough and indicate that the manos used with these metates were rubbed back and forth in these trough-shaped grinding surfaces. It seems probable that the oblong manos were used with the troughed metates because they have been found in association with such metates, fit with them, and are most numerous in the later houses where the trough metates are found. For example, an oblong mano was found resting on the shelf of a troughed metate in Pit-house D, Twin Bridges site. Such manos are frequently of the "rocker bottom" type. Finally, use of a mano with a rotary motion in a deep basin metate would have a tendency to grind the corners off and make the ends of the mano round, whereas

use of the mano with a back and forth motion in a deep trough would have a tendency to grind off the ends until they were more nearly square.

In general, the pestles from all the sites have roughly round, pecked and battered working ends, such as would result from pounding materials in the concave (and equally rough) cups of the mortars.

The range in hammerstones comprises a graded series from fresh, sharp, angular cores to those that have the angles rounded off through prolonged use. Such stones were probably used as pecking stones to roughen the grinding surfaces of the metates and manos. A secondary use may have been as a tool for percussion chipping. Fresh slab metates were found with the grinding surfaces outlined by a pitted area such as might have been made with these stones.

Occasional polishing stones on which only the faceted surface of the stone is polished smooth were probably faceted and polished through use. Such facets frequently comprise all of one surface of these implements. Among historic tribal groups such implements are used for polishing pottery and acquire similar facets from prolonged use. There is also a rough correlation between the increased use of polished pottery and the number of polishing stones found. With the decline of Alma Rough and the increase in Alma Plain and San Francisco Red the number of polishing stones increases; but as soon as there is a fair increase in the use of textured wares the frequency of polishing stones decreases.

In a number of instances at the SU site awls were found together in caches suggesting their use together as part of a set of tools. A "set" of this kind was found in a pit in Pit-house D, Promontory site. One of these awls has across the tip transverse grooves, which suggest use in separating the weft threads in weaving.

On several other occasions artifacts were found in such association as to corroborate concepts we had as to their use. For example, in three separate instances manos were found in direct association with metates. In one instance (mentioned above), the mano was still in place on the metate; in the other two the manos lay directly beside and partly underneath the metates. These were all small oblong manos with trough metates. Of the several metates found standing in their original position, two were placed well inside the house toward the center and over to one side, and the others were placed near the lateral entryway. One metate, found in a burned house, had been left leaning up against the wall of the entrance passageway with the grinding surface turned toward the wall.

Although pestles were found in direct association with mortars at the SU site, this type of association was not found at the other sites in the Pine Lawn Valley.

In relation to the functions of artifacts it should be noted that the distinctions made between several of the categories in the process of classification were quite arbitrary and were made simply on the basis of dimensions. For example, the largest oval polishing stones with single facets are actually indistinguishable from the smallest oval rubbing stones with single, flat, rubbing surfaces; and in like manner the largest rubbing stones of this category cannot be distinguished from the smaller oval one-hand manos with single, flat, grinding surfaces. There is little doubt that such implements were used interchangeably as rubbing stones and as one-hand manos with the metates. Some of these stones were found in direct association with metates at the SU site, but such instances are exceptional and it seems probable that they had another principal function. For a similar reason we can draw no absolute separation between some of the random flake knives and scrapers. They too were probably used interchangeably. However, to facilitate comparison with previous reports, the thicker, larger implements have been classed as scrapers and the thinner, smaller ones as knives. Furthermore, the battered ends of certain manos and larger rubbing stones indicate that they were used as pestles or hammerstones as well as for manos with the metates. Also, the smooth, flat surfaces occasionally found on multifaced pestles suggest their use as rubbing stones or manos. Naturally such instances do not add to our certainty in applying semi-functional terms to the artifacts, and it is fortunate that they are as exceptional as they are.

COMPARISON WITH ARTIFACTS OF DIFFERENT HORIZONS

A sufficient number of specimens of the primary categories of artifacts were found on sites of each period to indicate that there was a remarkable consistency in their occurrence throughout the span of Mogollon culture. However it was equally evident from certain gaps in the secondary categories (e.g., oval, oblong, round manos) that certain types did not have an equal popularity throughout the history of the culture. In order to ascertain more about these changes in popularity of types of artifacts, a table (Table 3) was constructed showing the frequencies of bone and stone artifact types in the various houses. The houses were arranged in order as determined by phase designation and by the trends in pottery types (see chart, Fig. 71).

A number of significant changes were indicated by this method. For example, it was found that oval manos occurred with greater frequency in the early houses than in the later houses, whereas oblong manos occurred with greater frequency in the later houses and less often in the earlier houses. In so far as could be determined, all classes of rubbing stones increased in popularity from early to late times. Metates were also more numerous in most of the late houses, and furthermore certain definite trends could be noted in metate types. The basin type metate, for example, decreased in popularity from early to late, as did the "trough open at one end only" type, although to a lesser extent. The slab type metate increased numerically to some extent, and the type with trough open at both ends was found only in houses of the Three Circle phase. Thus it may be seen that the basin type was most popular early, then decreased in popularity, with a correlated increase of the type with trough open at one end only, and this in turn was supplanted in popularity by the type with trough open at both ends. Meanwhile the slab type increased in popularity only as the total number of metates of all types increased. It was actually always the first stage or "raw material" of each metate as was shown by slabs on which oblong troughs or oval basin grinding surfaces had been outlined by pecking. A similar trend was observed by Haury (1936a, pp. 30–31, 70, 104–105) at the Mogollon Village and Harris sites as well as at Forestdale (Haury, 1940, pp. 99–101). The Cosgroves (Cosgrove, H. S. and C. B., 1932, pp. 35–37, Pls. 32–34) also describe a like trend in development at the Swarts ruin although on a later time level. Nesbitt (1938, pp. 100–101) notes a like trend at Starkweather, and Sayles (1945, pp. 49–51) describes the same for the San Simon branch.

Correlated with the increase in numbers of metates and manos is the decrease in the number of mortars and pestles found in the houses. These were particularly numerous in the houses of the early Pine Lawn phase at the SU site and appeared only sporadically in the houses of the late Pine Lawn phase at the Promontory site. No mortars were found in houses of the Three Circle phase, although a few pestles were recovered. On the other hand Haury (1936a, p. 38, Pl. XV) reports plain stone bowls, very much like the stone vessels we have termed mortars, from Mogollon Village; and Nesbitt (1938, p. 108, Pl. 45) reports the same for the houses of the San Francisco phase at Starkweather. Here the decrease in popularity is also indicated because as many mortars were found in one house

at the SU site as are reported from eleven houses excavated at the Mogollon Village (Haury, 1936a, p. 38). Some of the later forms at these sites are better finished on the exterior, and carved forms appear. We would agree with Roberts (1940, p. 119) and Woodbury (1939, pp. 75–76) that "mortars were more common in regions to the south and west than they were in the Anasazi province proper" and we would derive them from the pebble mortars of the Cochise culture. They occur both early and late in the Hohokam culture as manifested at Snaketown (Gladwin and others, 1937, p. 105). Apparently they do not occur so early in the Anasazi area; at least they have not been reported from Basket Maker sites, although they have been reported from Modified Basket Maker sites (Martin, P. S., 1939, p. 400).

There is an apparent increase in the frequency of polishing stones from early to late in the Pine Lawn phase. This trend may be roughly correlated with the decrease in Alma Rough and the increase in the use of Alma Plain, San Francisco Red and other polished wares. However the increase does not hold for our houses of the Three Circle phase. The increase in the amount of textured wares (Alma Neck Banded, Alma Scored, and Three Circle Neck Corrugated) and the corresponding decrease in Alma Plain and San Francisco Red may account for this decrease in the number of polishing stones.

Pipes increase in frequency slightly during the latter part of the Pine Lawn phase. The conical "cloud blower" type was found much less frequently than the tubular type. Tubular pipes were also more numerous at the Mogollon Village (Haury, 1936a, p. 38) and at Starkweather (Nesbitt, 1938, p. 104). Like mortars and pestles they have a southern distribution, although none have been found on Hohokam sites.

The trend in the popularity of mauls is not well defined, although there appears to be some increase from early to late. Both oval full groove and the three-quarter groove types appear early in the Pine Lawn phase, but the rectangular full groove type was found only in our Three Circle phase houses and so probably did not come into use until after the Pine Lawn phase. The full grooved type with shouldered groove also appears in the Pine Lawn phase. Haury (1936b, pp. 105–106) reports both full and three-quarter groove types from the Georgetown, San Francisco and Three Circle phases, as does Nesbitt (1938, p. 127). The three-quarter groove maul, like the three-quarter groove ax, has a southern distribution (Woodbury, 1939, p. 76), but the full grooved maul has a widespread distribution throughout the Southwest and beyond.

Projectile points, in contrast to mauls, show a marked and well-defined increase in the later houses of the Pine Lawn phase, although this increase dwindles away in the Three Circle houses. Leaf-shaped points (which Haury terms triangular) appear scarcely at all in the earliest houses, but are as numerous as other types late in the Pine Lawn phase. This type of projectile point is reported from Mogollon 1:15 (Haury, 1936b, p. 42). The leaf-shaped points with convex base are slightly more common than those with straight base in the Pine Lawn phase. These also appear at Forestdale in the phase of that name (Haury, 1940, p. 106). Nesbitt (1938, Pl. 47k) illustrates a similar point from one of the Starkweather pit-houses. The larger lateral notched points appear in the earliest houses of the Pine Lawn phase, show some increase in popularity at the end of that phase, and are found sporadically even in the Three Circle phase houses of the Pine Lawn Valley. The diagonal-notched projectile points with expanding stem were found only in occasional houses of the Pine Lawn phase. However this is the type that is most numerous at Mogollon 1:15 and the Harris site (Haury, 1940, pp. 42, 74) and is probably the typical point of the Georgetown and San Francisco phases. This type of projectile point is also illustrated by Nesbitt (1938, Pl. 47a) from a pit-house of an equivalent time level. On the basis of the present evidence it appears that the lateral-notched type, the diagonal-notched expanding stem type, and the leaf-shaped type projectile points all appeared in the Pine Lawn phase. The former type predominated in that phase, while the latter two types gained in popularity in the later phases—Georgetown and San Francisco. Finally, according to the evidence reported by Nesbitt for Starkweather and to that supplied by the surface survey, these types in turn were supplanted by the small, triangular, side-notched projectile point with serrate edges.

Both knives and scrapers are more numerous in the later pit-houses of the Pine Lawn phase than in the earlier houses, and there is a correlative gain in the various types of these artifacts. For example, both random flake knives and scrapers are found in larger numbers in the late Pine Lawn phase pit-houses than in the earlier ones.

Bone awls show the most marked and uniform increase from early to late of any type of artifact found. Although only one type—that with the head of the bone unworked except for splitting—was found in significant numbers, all types show some increase from early to late.

The temporal distribution of the notched awl in the Pine Lawn Valley sites corroborates and adds to the evidence found by Haury (1936a, pp. 110–111) and Nesbitt (1938, p. 107). It is found frequently in the Pine Lawn phase. It was found at both the SU and Promontory sites and also in the Three Circle phase pit-houses on the SU and Turkey Foot Ridge sites. It has a temporal distribution from the Pine Lawn phase up to the Reserve phase. Geographically, its distribution is confined to the south (Haury, 1936a, p. 110); it occurs with greatest frequency in the Mimbres branch. However, it is not reported from the Forestdale branch or from the San Simon branch. One is reported from a late phase of the Hohokam at the Snaketown site, but Haury attributes this to the meeting of Mogollon and Hohokam (Gladwin and others, 1937, p. 154).

Aside from questions of priority of origin, there are a number of traits that might be attributed to the Mogollon because they appear to have their center of distribution well to the south of the San Juan area. These are boulder mortars, multifaced pestles, pebble mortars, plain stone vessels, basin metates, three-quarter groove mauls and notched awls. These artifact types are reported sporadically in sites north of the Little Colorado, usually only where there is other evidence of "southern" influence. Although they appear to be particularly typical of the Mimbres branch, with the exception of the notched bone awl, they have been found in sites of the San Simon and Forestdale branches as well. In the earlier phases of these branches the chopper might be added to the list. However, in the later phases, such as the Forestdale phase at Forestdale, the Encinas phase of the San Simon, and the Mimbres phase at Swarts, Mattocks and Cameron Creek, the three-quarter groove and full groove axes appear.

In this connection the differences between the Mogollon metates with trough open at one end only and the analogous Anasazi metate, sometimes termed the "scoop" type, should be made clear because of their importance in marking a geographical transition in culture. It is possible that they are the result of two different methods of grinding on an approximately contemporary level. The trough of the scoop type has fairly straight parallel sides, whereas the analogous Mogollon type has curved sides that are frequently asymmetrical and not so close to parallel. The walls of the scoop type are more nearly vertical, the mouth of the trough is more open, less constricted, and the upper end is more rectangular and less rounded. On the contrary, the Mogollon type with trough open at one end only has

walls that curve in so that the mouth of the trough is sometimes quite constricted, and the upper end is more rounded. The scoop type metates are thinner, in both the average and the extremely thin specimens. These differences are most apparent in the material from the Bluff site, where the two types occurred together. The Mogollon type was found in the earlier pit-houses, the scoop type in later houses. However, this transition is also to be observed in the differences between metate types from the Bluff, SU, and Cave Creek sites. At the Bluff site (Haury and Sayles, 1947) the basin type metate is less frequent than it is at any of these other sites, and there is a corresponding resemblance of the trough "open at one end only" metate to the scoop type. At the SU site the number of trough type metates about equals the number of basin type, and another kind—the shallow basin or slab type—predominates. Here resemblances to an open basin metate are more marked, and resemblances to the scoop type very difficult to see if they are present. However, something more like the scoop type comes in during the Three Circle phase in the transition to the trough metate. In the Penasco phase this trend toward the use of the basin type and the rotary grinding technique culminates. Here the basin type predominates and the trough and slab types occur rarely.

Other resemblances between the artifacts of the Pine Lawn phase, the Hilltop phase and the Penasco phase are unusually close, considering the distances separating the type sites of each. Resemblances are so close in such traits as some mano types, boulder mortars, multifaced pestles, pebble mortars, scrapers, knives—in fact, the majority of traits—that those from one of these phases are practically indistinguishable from those of another.

One rather minor difference was noted. In the Penasco phase material there is a tendency for most of the stone and bone artifact types to be the same as those of the San Pedro stage of the Cochise culture, whereas in the Pine Lawn phase the resemblance is closer to the artifacts of the Chiricahua stage. These resemblances are exemplified in the manos, or handstones. The typical Penasco phase handstones, like those of the San Pedro stage, are large, round, and thick, although other types occur. Typical Pine Lawn phase manos are smaller and more oval, like the Chiricahua manos. The large, thick, round manos found in the San Pedro stage or the Penasco phase are rare or lacking in the Pine Lawn Valley.

Evidence of extensive trade was exceedingly rare in our excavations. No shell, such as was found at the SU site, was found at the

Promontory site. However, one fragment of a shell bracelet was found in Pit-house C, Twin Bridges site of the Three Circle phase. One bone die was found in Pit-house A at Promontory site. This trait occurs only rarely at the SU site or other Mogollon sites of comparable age and is believed to be a San Juan Anasazi trait because of its frequent occurrence in that area. These were the only evidences of trade found in the 1947 season in addition to the fragments of trade pottery that appeared in houses of the Three Circle phase. No more stubby awls or conical pipes such as were found at the SU site were recovered.

On the whole it is apparent that the crafts manifested in the stone and bone artifacts were more stable than those manifested in pottery. Between the Pine Lawn and the Reserve phases the number of innovations and modifications in the stone and bone traits were few. In fact, very nearly the complete assemblage of traits represented in the San Francisco phase were present in the Pine Lawn phase (although in different frequencies). The Pine Lawn phase in turn had very close resemblances in the stone categories to those of the Cochise culture.

MANOS

(Figs. 48, 49, 50)

Manos with single grinding surfaces:

(a) Oblong in outline, surfaces parallel, grinding surface convex..... 4
From Pit-houses A, C, Promontory; D, Twin Bridges; Room F, Oak Springs Pueblo
Length: maximum, 19.2 cm.; minimum, 12.8 cm.; average, 16.7 cm.
Width: maximum, 11.4 cm.; minimum, 7.9 cm.; average, 10.1 cm.
Thickness: maximum, 7.8 cm.; minimum, 4.5 cm.; average, 6.7 cm.

(b) Oblong in outline, surfaces parallel, grinding surfaces slightly convex. 11
From Pit-houses A, B, C, Promontory; B, Turkey Foot Ridge; D, Twin Bridges
Length: maximum, 22.1 cm.; minimum, 14.9 cm.; average, 18.2 cm.
Width: maximum, 12.5 cm.; minimum, 6.6 cm.; average, 10.6 cm.
Thickness: maximum, 5.4 cm.; minimum, 2.1 cm.; average, 3.7 cm.

(c) Oblong in outline, surfaces parallel, grinding surface flat (Fig. 48, *c*).. 13
From Pit-houses C, Promontory; A, B, Turkey Foot Ridge; C, D, Twin Bridges; Room F, Oak Springs Pueblo
Length: maximum, 23.5 cm.; minimum, 12.1 cm.; average, 18.4 cm.
Width: maximum, 14.4 cm.; minimum, 9.3 cm.; average, 11.2 cm.
Thickness: maximum, 8.7 cm.; minimum, 3.0 cm.; average, 5.3 cm.

(d) Oblong in outline, wedge-shaped in cross section, grinding surface flat..... 4
From Pit-house A, Promontory; D, Twin Bridges
Lengths, 17.4, 13.1 cm.; widths, 10.3, 9.8 cm.; thicknesses, 2.4, 2.7 cm.

(e) Oval in outline, surfaces parallel, grinding surface convex (Fig. 48, *b*). 10
From Pit-house B, Turkey Foot Ridge; C, D, Twin Bridges; Room C, Oak Springs Pueblo
Length: maximum, 19.5 cm.; minimum, 10.4 cm.; average, 14.8 cm.
Width: maximum, 13.8 cm.; minimum, 7.1 cm.; average, 11.2 cm.
Thickness: maximum, 8.2 cm.; minimum, 3.6 cm.; average, 6.1 cm.

(f) Oval in outline, surfaces parallel, grinding surface slightly convex (Fig. 48, *a*)..... 5
From Pit-house B, Turkey Foot Ridge
Length: maximum, 21.4 cm.; minimum, 14.6 cm.; average, 17.2 cm.
Width: maximum, 14.5 cm.; minimum, 8.4 cm.; average, 11.4 cm.
Thickness: maximum, 7.0 cm.; minimum, 2.5 cm.; average, 4.9 cm.

(g) Oval in outline, wedge-shaped in cross section, grinding surface flat (Fig. 49, *c*)..... 3
From Pit-houses A, B, Turkey Foot Ridge; D, Twin Bridges
Lengths, 18.8, 18.6, 18.1 cm.; widths, 14.0, 11.9, 12.2 cm.; thicknesses, 6.7, 5.6, 7.4 cm.

(h) Round in outline, surfaces parallel, grinding surface flat..... 3
From Pit-house B, Turkey Foot Ridge; D, Twin Bridges
Lengths, 9.5, 21.5, 12.4 cm.; widths, 9.4, 10.2 cm.; thicknesses, 5.4, 6.7, 5.1 cm.

(i) Round in outline, surfaces parallel, grinding surface slightly convex.. 1
From Pit-house D, Twin Bridges
Length, 12.8 cm.; width, 9.8 cm.; thickness, 6.7 cm.

(j) Rectangular in outline, surfaces parallel, grinding surface convex... 2
From Pit-house B, Turkey Foot Ridge
Lengths, 9.5, 13.4 cm.; widths, 4.5, 8.3 cm.; thicknesses, 3.8, 6.1 cm.

MANOS—*continued*

(Figs. 48, 49, 50)

(k) Rectangular in outline, surfaces parallel, grinding surface slightly convex (Fig. 49, *b*) 6
From Pit-houses B, C, Promontory; B, Turkey Foot Ridge
Length: maximum, 20.4 cm.; minimum, 13.0 cm.; average, 16.6 cm.
Width: maximum, 12.2 cm.; minimum, 10.2 cm.; average, 11.1 cm.
Thickness: maximum, 4.5 cm.; minimum, 2.9 cm.; average, 3.8 cm.

(l) Rectangular in outline, surfaces parallel, grinding surface flat (Fig. 49, *a*) 10
From Pit-houses A, C, Promontory; A, B, Turkey Foot Ridge; A, Twin Bridges; Room B, Oak Springs Pueblo
Length: maximum, 22.1 cm.; minimum, 13.3 cm.; average, 18 cm.
Width: maximum, 13.1 cm.; minimum, 10.3 cm.; average, 11.6 cm.
Thickness: maximum, 6.4 cm.; minimum, 3.2 cm.; average, 4.3 cm.

(m) Square in outline, surfaces parallel, grinding surface flat 1
From Pit-house C, Promontory
Length, 12.9 cm.; width, 10.0 cm.; thickness, 6.6 cm.

(n) Turtleback type, rectangular to oval in outline, surfaces parallel, grinding surface convex lengthwise, slightly convex crosswise (Fig. 50, *a*) 3
From Pit-house B, Turkey Foot Ridge; D, Twin Bridges
Lengths, 15.4, 16.7, 17.2 cm.; widths, 12.2, 3.9, 11.4 cm.; thicknesses, 4.5, 5.9, 2.7 cm.

(o) Irregular in outline, surfaces parallel, grinding surface flat (Fig. 50, *b*). 4
From Pit-house C, Promontory; B, Turkey Foot Ridge; D, Twin Bridges
Length: maximum, 18.8 cm.; minimum, 13.4 cm.; average, 15.6 cm.
Width: maximum, 12.9 cm.; minimum, 10.1 cm.; average, 11.5 cm.
Thickness: maximum, 9.3 cm.; minimum, 5.2 cm.; average, 6.9 cm.

Manos with two grinding surfaces:

(a) Round in outline, surfaces parallel, convex 1
From Pit-house D, Twin Bridges
Length, 14.4 cm.; width, 11.7 cm.; thickness, 7.1 cm.

(b) Oval in outline, surfaces parallel, slightly convex (Fig. 50, *c*) 2
From Pit-house D, Twin Bridges
Lengths, 20.0, 16.0 cm.; widths, 13.5, 12.3 cm.; thicknesses, 4.2, 5.6 cm.

(c) Rectangular in outline, surfaces parallel, flat 2
From Pit-house A, Promontory; C, Twin Bridges
Lengths, 19.6 cm. (one fragment); widths, 13.5, 10.8 cm.; thicknesses, 5.2, 3.6 cm.

(d) Irregular in outline, surfaces parallel, slightly convex 1
From Pit-house B, Turkey Foot Ridge
Length, 16.3 cm.; width, 14.2 cm.; thickness, 7.9 cm.

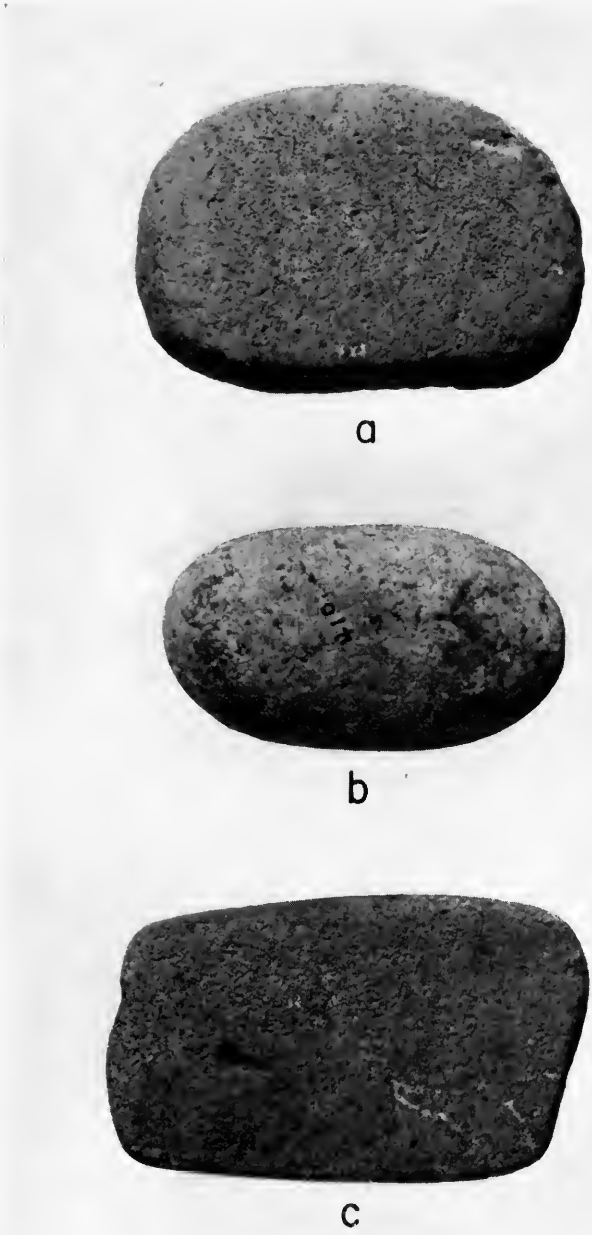


FIG. 48. Manos. Length of *c*, 19.2 cm.

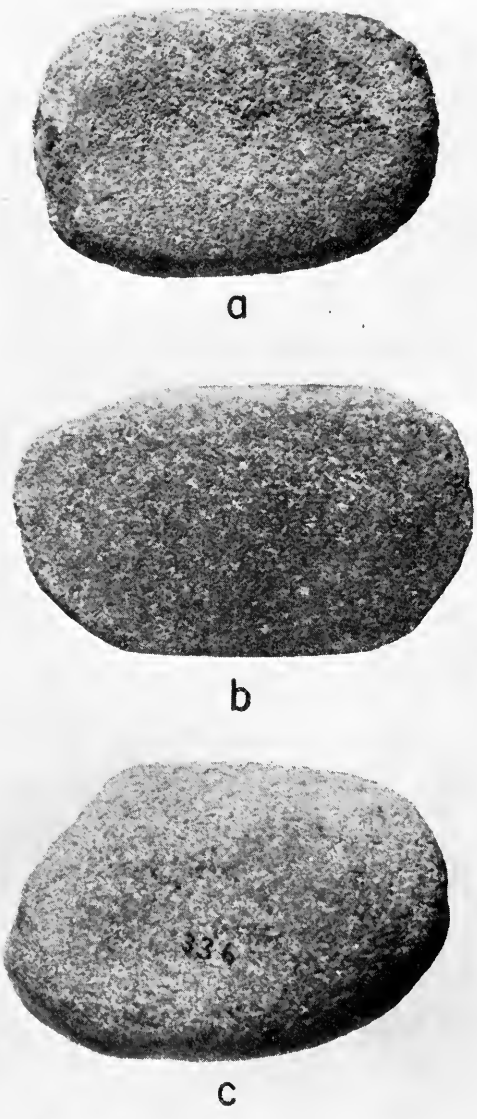


FIG. 49. Manos. Length of *c*, 18.1 cm.

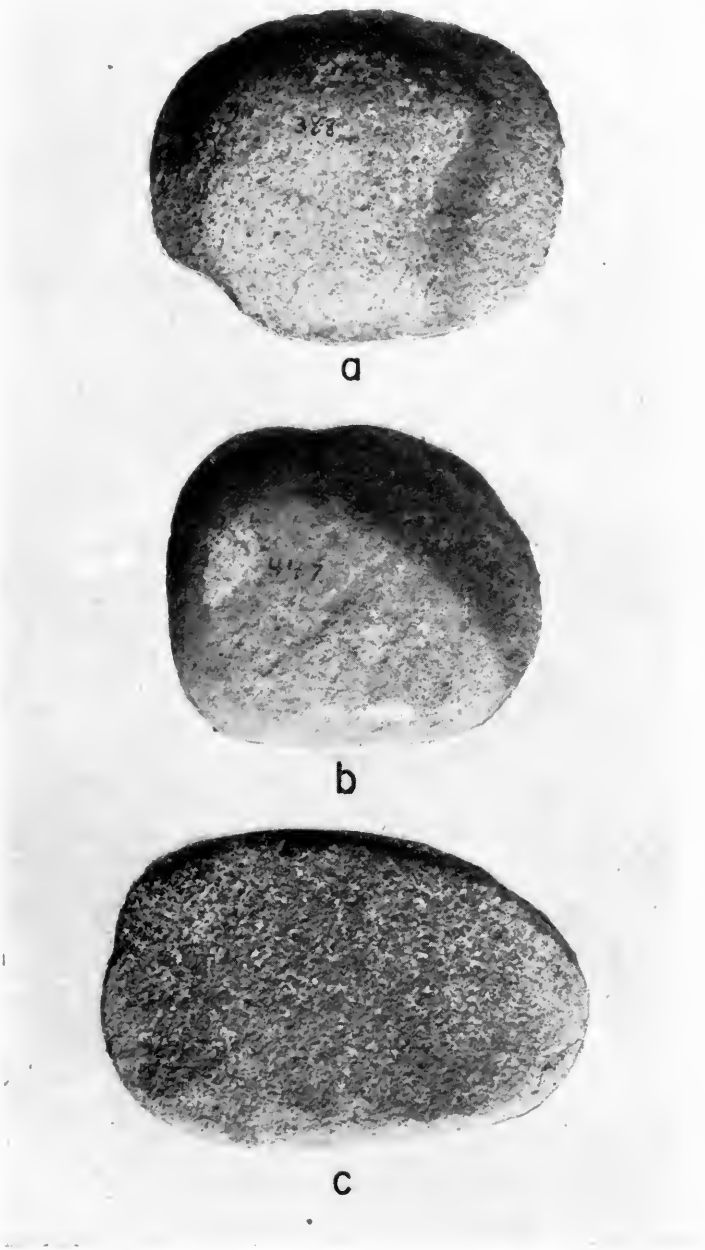


FIG. 50. Manos. Length of *c*, 20 cm.

RUBBING STONES

(Fig. 51)

Rubbing stones with single rubbing surfaces:

(a) Oval in outline, surfaces parallel, rubbing surface slightly convex (Fig. 51, *c*) 10
From Pit-house C, Promontory; A, B, Turkey Foot Ridge; D, Twin Bridges
Length: maximum, 11.0 cm.; minimum, 8.1 cm.; average, 9.5 cm.
Width: maximum, 8.4 cm.; minimum, 4.8 cm.; average, 7.9 cm.
Thickness: maximum, 7.8 cm.; minimum, 2.1 cm.; average, 4.6 cm.

(b) Oval in outline, surfaces parallel, rubbing surface flat (Fig. 51, *a*) 5
From Pit-houses A, B, Turkey Foot Ridge; B, D, Twin Bridges
Length: maximum, 11.2 cm.; minimum, 8.1 cm.; average, 9.2 cm.
Width: maximum, 8.4 cm.; minimum, 5.4 cm.; average, 6.6 cm.
Thickness: maximum, 3.4 cm.; minimum, 2.2 cm.; average, 2.7 cm.

(c) Roughly round in outline, surfaces parallel, rubbing surface flat 4
From Pit-houses A, C, Promontory; B, Turkey Foot Ridge
Length: maximum, 10.2 cm.; minimum, 8.0 cm.; average, 8.8 cm.
Width: maximum, 8.2 cm.; minimum, 6.7 cm.; average, 7.3 cm.
Thickness: maximum, 3.9 cm.; minimum, 2.4 cm.; average, 2.9 cm.

(d) Oblong in outline, wedge-shaped in cross section, rubbing surface flat. 1
From Room B, Oak Springs Pueblo, with Burial 1
Length, 9.2 cm.; width, 6.8 cm.; thickness, 2.3 cm.

(e) Oblong in outline, surfaces parallel, rubbing surface slightly convex .. 2
From Pit-house C, Promontory; Room F, Oak Springs Pueblo
Length, 11.2 cm.; width, 9.1 cm.; thickness, 7.5 cm. (one fragment)

(f) Triangular in outline, surfaces parallel, single flat rubbing surface ... 3
From Pit-houses A, C, Promontory; B, Turkey Foot Ridge
Lengths, 10.3, 10.2 cm. (one fragment); widths, 5.7, 8.7, 6.4 cm.; thicknesses, 2.9, 6.6, 3.8 cm.

Rubbing stones with two rubbing surfaces:

(a) Rectangular in outline, rubbing surfaces parallel, flat (Fig. 51, *b*) 2
From Pit-house B, Turkey Foot Ridge; D, Twin Bridges
Lengths, 10.3, 11.9 cm.; widths, 8.2, 9.9 cm.; thicknesses, 4.0, 8.9 cm.

FIG. 51. Rubbing stones. Length of *c*, 9.2 cm.

PESTLES

(Fig. 52)

(a) Angular type, long angular stone, unaltered except for one end, which is round, pecked and battered 1

From Pit-house A, Turkey Foot Ridge

Length, 15.3 cm.; width, 8.4 cm.; thickness, 5.7 cm.

(b) Multifaced type, roughly round pebbles, with some pecked, flat surfaces, and battered ends 7

From Pit-houses A, C, Promontory; B, Turkey Foot Ridge; D, Twin Bridges

Length: maximum, 12.7 cm.; minimum, 8.9 cm.; average, 11.1 cm.

Width: maximum, 10.4 cm.; minimum, 8.0 cm.; average, 9.1 cm.

Thickness: maximum, 9.8 cm.; minimum, 6.9 cm.; average, 8.5 cm.

FIG. 52. Pestles: *a–d*, multifaced type; *e*, angular type. Length of *d*, 12.1 cm.

METATES

(Figs. 53–55)

(a) Slab type, large slab, generally oblong or oval in outline with flat or slightly concave upper surface; bottom and sides of slab unworked; grinding surface sometimes pecked 8

From Pit-houses A, B, C, Promontory; A, B, Turkey Foot Ridge

Length: maximum, 48.1 cm.; minimum, 32.9 cm.; average, 40.5 cm.

Width: maximum, 34.3 cm.; minimum, 24.7 cm.; average, 30.3 cm.

Thickness: maximum, 8.8 cm.; minimum, 3.9 cm.; average, 5.9 cm.

(b) Basin type with secondary depression, unshaped, roughly round block of stone with grinding surface worn to shallow depression; small cup-shaped hole in center of this depression; bottom and sides of boulder unaltered 1

From Pit-house D, Promontory

(Fragment; no measurements)

(c) Trough type; trough open at one end only; made from unshaped, roughly oblong block of stone; grinding surface trough-shaped; sides of trough curve slightly; bottom of trough slopes up steeply at closed end; grinding surface pecked 3

From Pit-house B, Promontory; A, B, Turkey Foot Ridge

Length, 45.7 cm.; width, 34.2 cm.; thickness, 10.0 cm.

Dimensions of trough: length, 30 cm.; width, 21 cm.; depth, 3.0 cm.

(d) Trough type; trough open at both ends; made of unshaped blocks of stone roughly oblong in outline; one end of trough slopes up slightly; grinding surface pecked 8

From Pit-houses A, B, Turkey Foot Ridge; D, Twin Bridges

Length: maximum, 49.8 cm.; minimum, 45.7 cm.; average, 46.2 cm.

Width: maximum, 48.2 cm.; minimum, 25.7 cm.; average, 35.8 cm.

Thickness: maximum, 16.7 cm.; minimum, 8.0 cm.; average, 10.9 cm.

Width of trough: maximum, 23.2 cm.; minimum, 20.3 cm.; average, 22.2 cm.

Depth of trough: maximum, 12.3 cm.; minimum, 2.0 cm.; average, 5.1 cm.

FIG. 53. Trough type metate, trough open at one end only. Length, 45.7 cm.

FIG. 54. Trough type metate, trough open at both ends. Length, 49.1 cm.

FIG. 55. Trough type metate and mano *in situ*, Pit-house B, Turkey Foot Ridge site.

SMALL, METATE-LIKE GRINDING STONES

(Fig. 56)

Small slabs of stone, asymmetrical in outline, with single smooth, flat or slightly concave, grinding surface; bottom surface usually unworked; occasionally bottom beveled so that upper surface slopes 5

From Pit-house A, B, Turkey Foot Ridge

Length: maximum, 27.5 cm.; minimum, 18.9 cm.; average, 23.5 cm.

Width: maximum, 21.9 cm.; minimum, 14.4 cm.; average, 18.0 cm.

Thickness: maximum, 7.7 cm.; minimum, 2.1 cm.; average, 4.3 cm.

FIG. 56. Small, metate-like grinding stones. Length of left specimen, 27.5 cm.

WORKED (PIKI?) SLABS

(Fig. 57)

Thin stone slabs; irregular in outline; upper surface smooth, flat; lower surface rough; edges occasionally worked 6

From Pit-house B, Turkey Foot Ridge

Length: maximum, 40.3 cm.; minimum, 38.7 cm.; average, 39.4 cm.

Width: maximum, 36.3 cm.; minimum, 24.4 cm.; average, 30.3 cm.

Thickness: maximum, 4.3 cm.; minimum, 2.3 cm.; average, 3.1 cm.

FIG. 57. Worked slab. Length, 38.7 cm.

MORTARS

(Fig. 58)

Pebble type; large, porous, roughly round pebbles with cup-shaped depression in one face 2
From Pit-houses A, B, Promontory
Diameters, 15.4, 22.1 cm.; thicknesses, 8.6, 12.3 cm.

STONE DISHES

(Fig. 58)

Roughly round or oval pebbles with smooth shallow depression worked in one face 2
From Pit-house A, Promontory
Lengths, 7.6, 6.8 cm.; widths, 6.5, 5.5 cm.; thicknesses, 1.8, 2.1 cm.

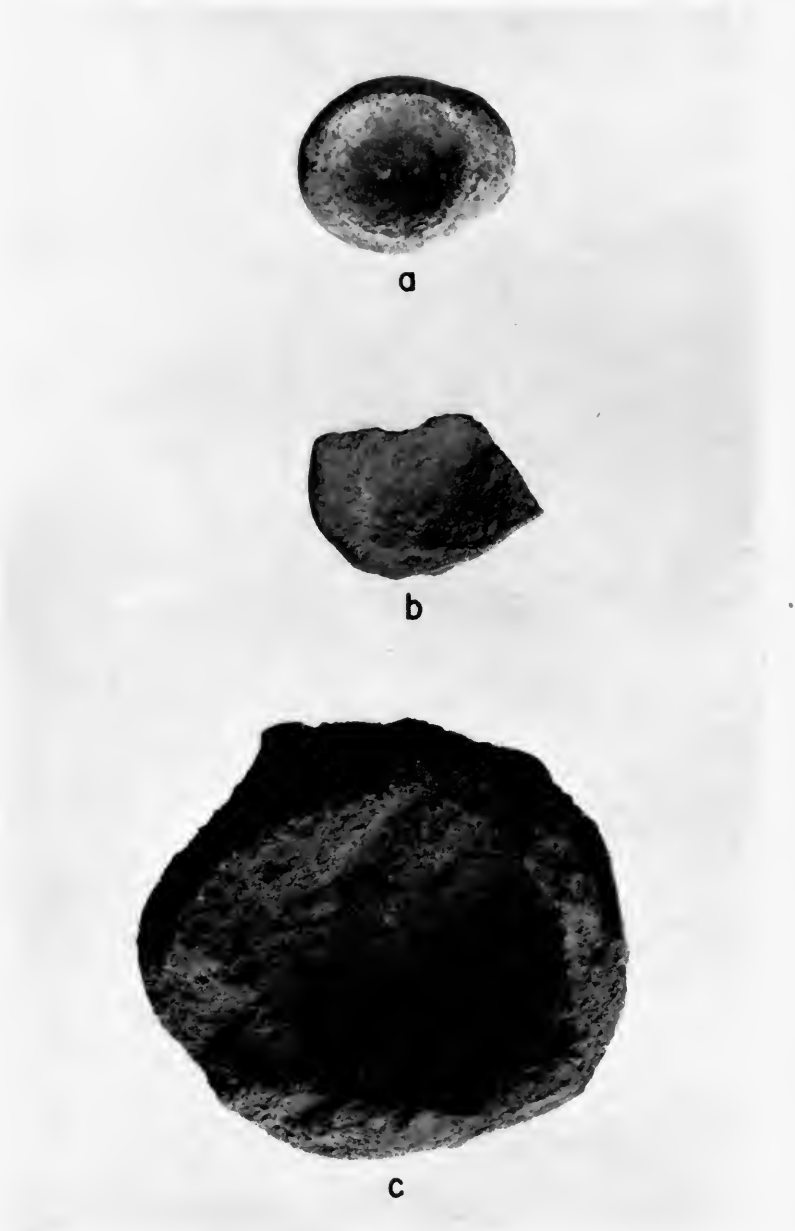


FIG. 58. Stone dishes and mortar. *a–b*, stone dishes; *c*, pebble mortar. Diameter of *c*, 15.4 cm.

POLISHING STONES

(Fig. 59)

Small pebbles, oval or roundish in outline, with one or more flat, smooth, polishing surfaces..... 62

From Pit-houses A, B, C, D, Promontory; B, Turkey Foot Ridge; A, C, D, Twin Bridges; Room B, Oak Springs Pueblo

Length: maximum, 8.4 cm.; minimum, 2.9 cm.; average, 5.4 cm.

Width: maximum, 7.3 cm.; minimum, 2.1 cm.; average, 4.0 cm.

Thickness: maximum, 5.3 cm.; minimum, 1.1 cm.; average, 2.2 cm.

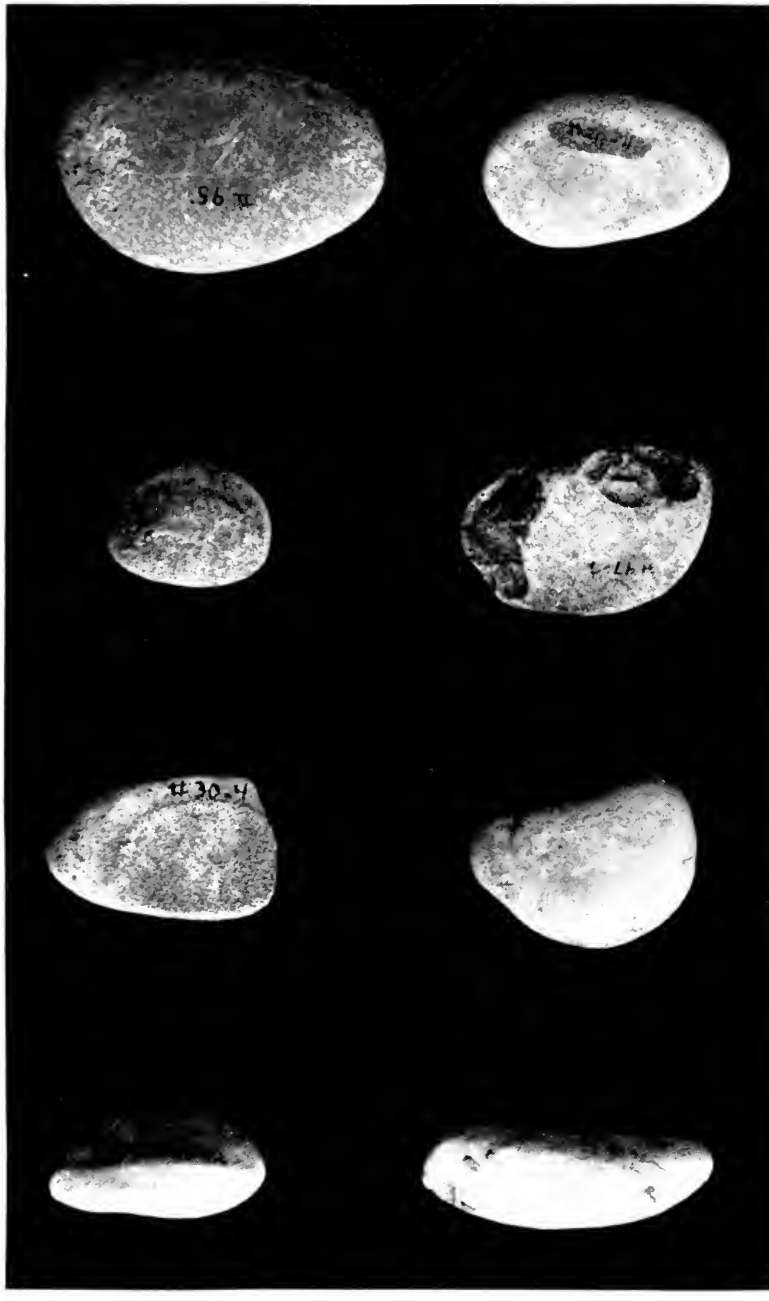


FIG. 59. Polishing stones. Length of lower left specimen, 5.3 cm.

HAMMERSTONES

(Fig. 60)

Battered and pitted pebbles mostly of round and angular shapes..... 7
From Pit-houses A, C, D, Promontory; B, Turkey Foot Ridge
Diameter: maximum, 11.4 cm.; minimum, 6.5 cm.; average, 9.9 cm.

CHOPPERS

(Fig. 60)

Large, angular, core implements having one or more sides flaked to sharp cutting edge, frequently plano-convex in cross section, occasionally part of the original crust of stone left intact..... 4
From Pit-house C, Promontory; A, B, Turkey Foot Ridge
Length: maximum, 11.4 cm.; minimum, 6.5 cm.; average, 7.8 cm.
Width: maximum, 7.8 cm.; minimum, 5.7 cm.; average, 6.4 cm.
Thickness: maximum, 6.6 cm.; minimum, 2.3 cm.; average, 3.5 cm.

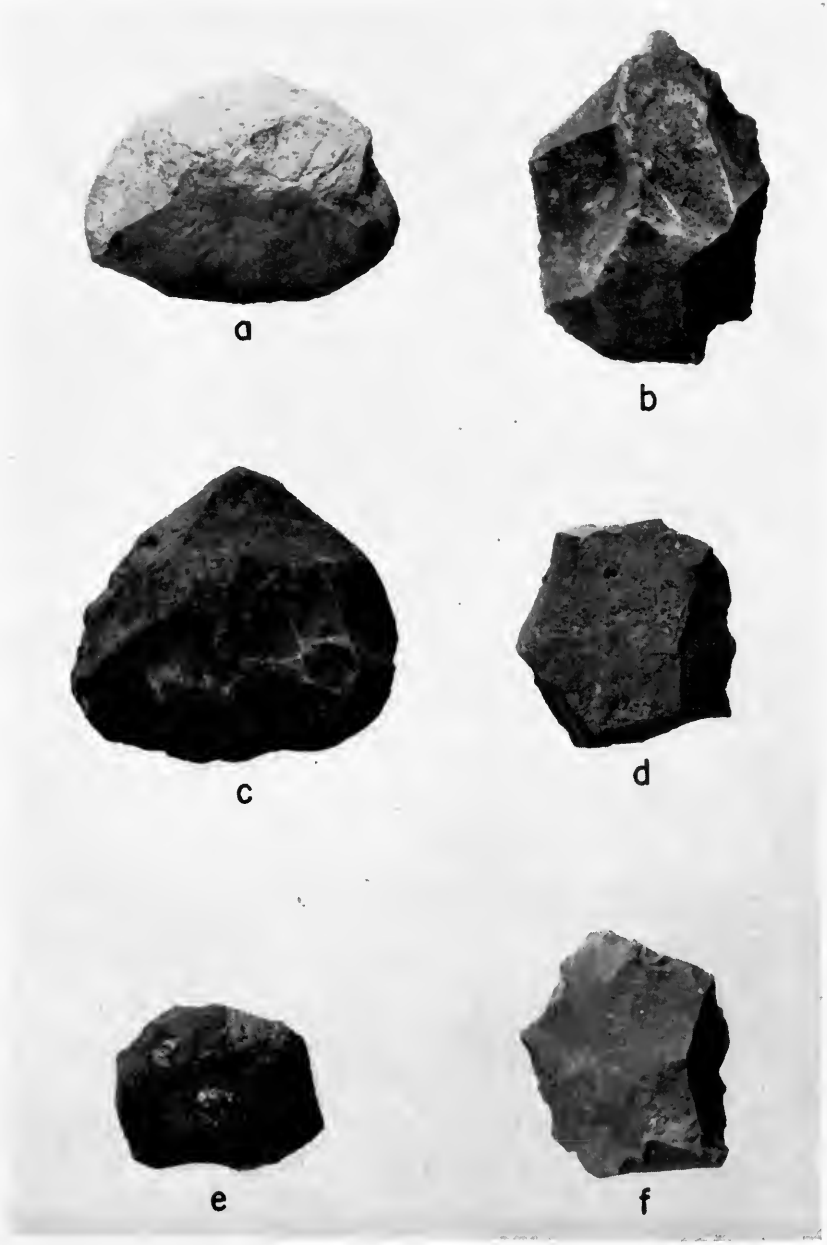


FIG. 60. Hammerstones and choppers. *a*, *c*, *e*, hammerstones; *b*, *d*, *f*, choppers. Length of *e*, 6.5 cm.

ABRADING STONE

(Fig. 61)

Roughly oblong, coarse-grained stone with grooves in side and upper surface.. 1
From Pit-house C, Promontory
Length, 9.6 cm.; width, 5.2 cm.; thickness, 3.4 cm.

PIPES

(Fig. 61)

Cylindrical or tubular type, tapering slightly from larger bowl end to smaller stem end, greatest exterior diameter about one-eighth distance from bowl end; central bore through pipe smallest about one-third distance from bowl end; one specimen with bore unfinished..... 3
From Pit-houses A, B, C, Promontory
Lengths, 7.5, 13.4, 9.3 cm.; diameters, 3.2, 8.0, 4.6 cm.

HOES

(Fig. 61)

Thin plates of stone roughly oblong in outline; edges chipped and beveled.... 2
From Pit-house C, Promontory; B, Turkey Foot Ridge
Length, 11.8 cm.; width, 5.9 cm.; thickness, 1.7 cm. (one fragment)

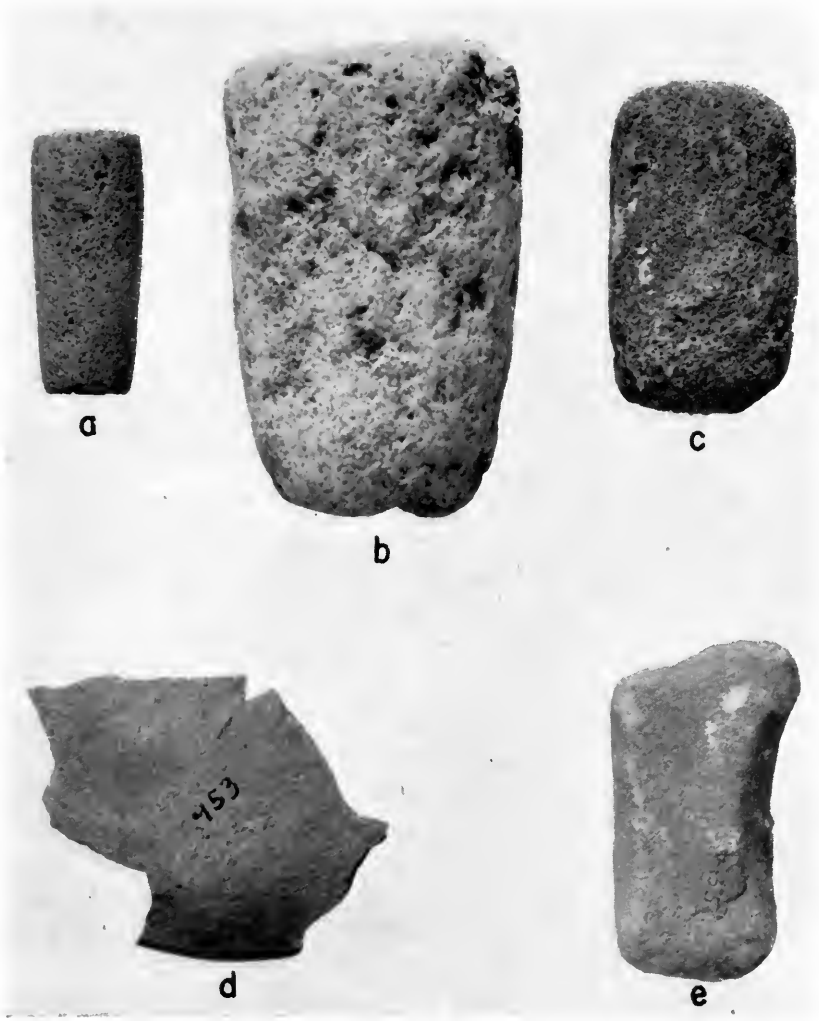


FIG. 61. Pipes, hoe fragment, and abrading stone. *a–c*, tubular pipes; *d*, hoe fragment; *e*, abrading stone. Length of *e*, 9.6 cm.

PROJECTILE POINTS

(Fig. 62)

(a) Corner-notched, expanding stem narrower than shoulder, straight base (Fig. 62, *f*, *g*, *h*) 3

From Pit-house C, Promontory; B, Turkey Foot Ridge; Room A, Oak Springs Pueblo

Lengths, 3.8, 4.1, 4.1 cm.; widths, 2.3, 2.1, 2.4 cm.; thicknesses, 1.5, 0.3, 0.5 cm.

(b) Short, leaf-shaped in outline; upper portion of edges slightly convex, basal portion of edges straight, straight base (Fig. 62, *i*, *j*) 2

From Pit-house A, Promontory

Lengths, 2.3, 2.8 cm.; widths, 2.0, 1.9 cm.; thickness, 0.5 cm. (both same thickness)

(c) Lateral-notched with slightly expanding stem narrower than shoulder, edges convex (Fig. 62, *l*) 1

From Pit-house E, Promontory

Length, 3.1 cm.; width, 1.7 cm.; thickness, 0.5 cm.

(d) Small, slender, lateral-notched point with slightly convex edges, stem broken off (Fig. 62, *k*) 1

From Room B, Oak Springs Pueblo

Length, 2.7 cm.; width, 1.3 cm.; thickness, 0.4 cm.

DRILLS

(Fig. 62)

Long, slender, pointed flakes, biconvex in cross section, with secondary chipping on both surfaces and edges; taper from relatively wide thick base; one with broad flange base 5

From Pit-houses D, E, Promontory; A, B, Turkey Foot Ridge

Length: maximum, 5.9 cm.; minimum, 2.4 cm.; average, 4.2 cm.

Width: maximum, 1.7 cm.; minimum, 1.2 cm.; average, 1.5 cm.

Thickness: maximum, 1.0 cm.; minimum, 0.4 cm.; average, 0.6 cm.

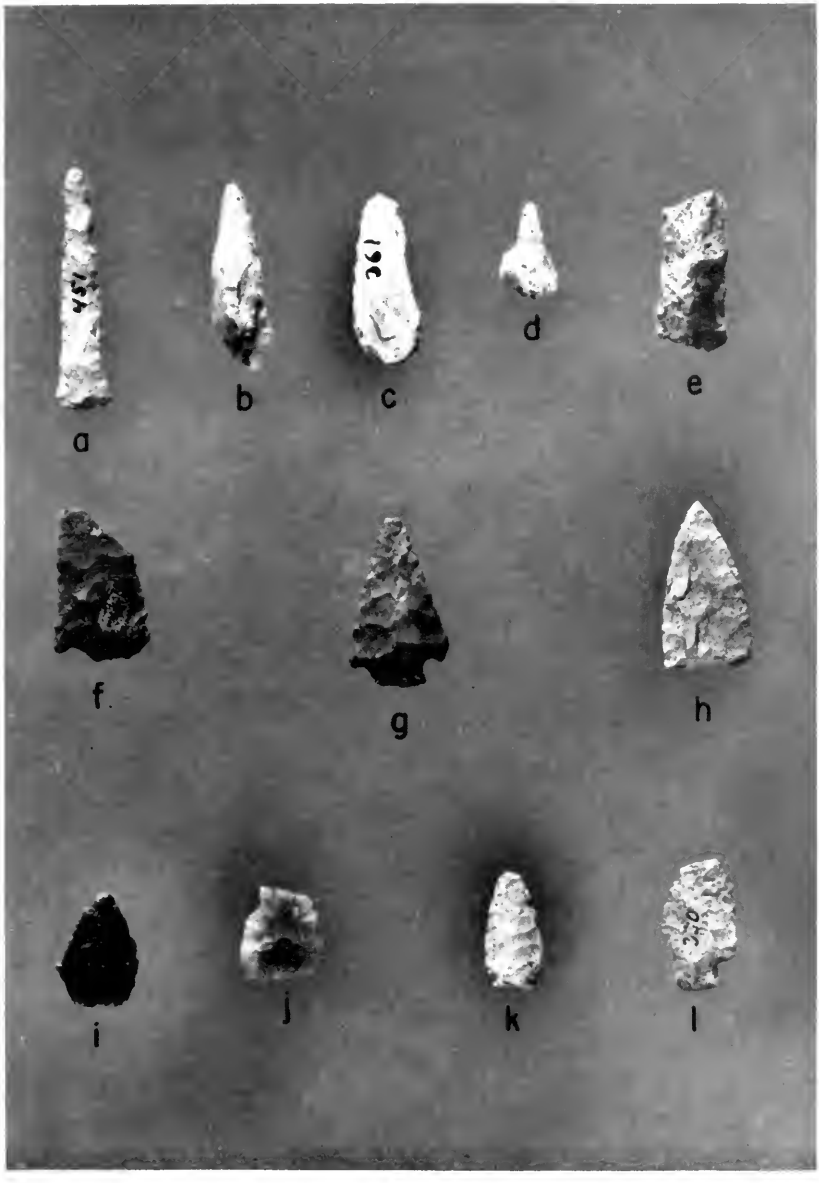


FIG. 62. Drills and projectile points. *a–e*, drills; *f–l*, projectile points. Length of *i*, 2.8 cm.

KNIVES

(Fig. 63)

(a) Random flakes; any convenient suitable thin flake slightly chipped along one edge; upper surface occasionally made flat by the removal of long thin flakes 63

From Pit-houses A, B, C, D, E, Promontory; A, B, Turkey Foot Ridge; B, C, Twin Bridges; Rooms A, B, Oak Springs Pueblo

Length: maximum, 7.9 cm.; minimum, 2.1 cm.; average, 4.1 cm.

Width: maximum, 4.7 cm.; minimum, 1.2 cm.; average, 2.5 cm.

Thickness: maximum, 1.9 cm.; minimum, 0.3 cm.; average, 0.8 cm.

(b) Thin concavo-convex flakes with one inward curving edge chipped through use 4

From Pit-house A, Promontory; A, Turkey Foot Ridge

Length: maximum, 6.3 cm.; minimum, 4.1 cm.; average, 5.3 cm.

Width: maximum, 4.3 cm.; minimum, 2.0 cm.; average, 2.7 cm.

Thickness: maximum, 1.2 cm.; minimum, 0.6 cm.; average, 0.8 cm.

(c) Blades with curved edges and secondary chipping on all major surfaces ... 1

From Pit-house A, Turkey Foot Ridge

Length, 5.6 cm.; width, 2.2 cm.; thickness, 0.9 cm.

FIG. 63. Knives (miscellaneous types). Length of lower right specimen, 4.7 cm.

SCRAPERS

(Figs. 64–66)

(a) Convenient thick flakes with poorly directed retouch along one or more curved sharp edges; upper surface shaped by percussion chipping; secondary chipping on some specimens may be result of use..... 119

From Pit-houses A, B, C, D, E, Promontory; A, B, Turkey Foot Ridge; Rooms A, B, F, Oak Springs Pueblo

Length: maximum, 6.7 cm.; minimum, 2.1 cm.; average, 4.5 cm.

Width: maximum, 6.0 cm.; minimum, 1.8 cm.; average, 3.1 cm.

Thickness: maximum, 3.1 cm.; minimum, 0.4 cm.; average, 1.3 cm.

(b) Large, rough, thick, angular flakes with percussion chipping on one or more surfaces and frequently pressure chipping along one edge; cleavage surface usually unaltered..... 13

From Pit-houses A, C, D, Promontory; A, Turkey Foot Ridge; Room F, Oak Springs Pueblo

Length: maximum, 11.7 cm.; minimum, 6.7 cm.; average, 7.7 cm.

Width: maximum, 9.4 cm.; minimum, 2.7 cm.; average, 5.3 cm.

Thickness: maximum, 3.7 cm.; minimum, 1.9 cm.; average, 2.5 cm.

(c) Thick, keel-shaped implements, roughly leaf-shaped in outline, with percussion chipping on convex surface and secondary chipping at broad end and edges..... 12

From Pit-houses A, B, C, E, Promontory; A, Turkey Foot Ridge; Room F, Oak Springs Pueblo

Length: maximum, 7.8 cm.; minimum, 3.2 cm.; average, 5.4 cm.

Width: maximum, 6.1 cm.; minimum, 2.9 cm.; average, 4.2 cm.

Thickness: maximum, 3.4 cm.; minimum, 1.2 cm.; average, 2.0 cm.

(d) Thick biconvex flakes with secondary chipping on both surfaces and edges..... 3

From Pit-house C, Promontory

Lengths, 6.4, 3.2, 4.5 cm.; widths, 4.2, 3.1, 2.4 cm.; thicknesses, 1.5, 1.1, 1.3 cm.

FIG. 64. Scrapers. Column *a*, biface; columns *b* and *c*, random flake. Length of bottom specimen, column *a*, 4.5 cm.

FIG. 65. Large random flake scrapers. Length of lower left specimen, 10.6 cm.

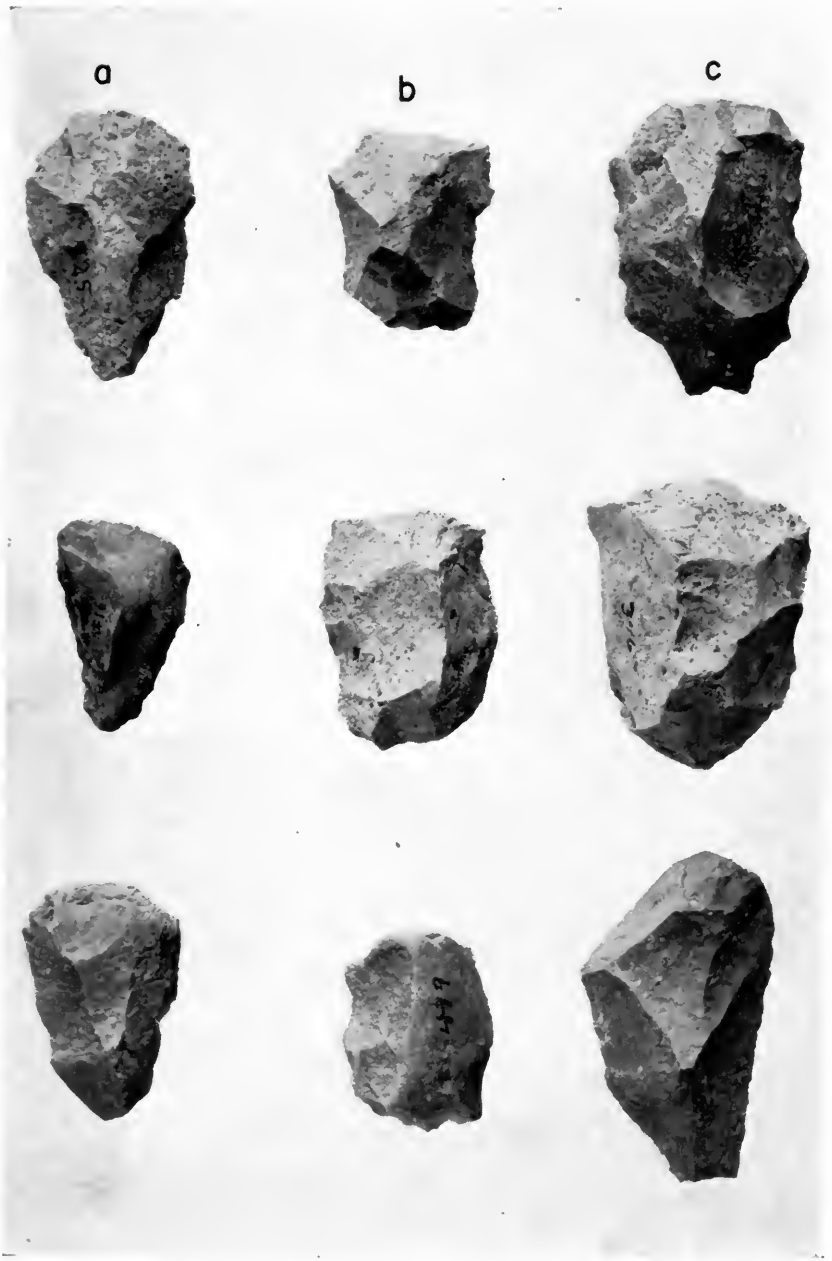


FIG. 66. Scrapers. Columns *a* and *b*, end scrapers; column *c*, keel-shaped scrapers. Length of bottom specimen, column *a*, 5.6 cm.

BRACELET

(Fig. 67)

Thin, flat, semicircular section of shell (fragment)..... 1
From Pit-house C, Twin Bridges
Width, 0.5 cm.; thickness, 0.2 cm.

AWLS

(Fig. 67)

(a) Head of bone unworked except by original splitting; other end ground and polished to sharp point; have side notches; made from deer metacarpal split in half (Fig. 67, *d*, *e*)..... 2
From Pit-house D, Promontory; B, Turkey Foot Ridge
Lengths, 25.3, 11.9 cm.

(b) Head of bone removed, other end ground and polished to sharp point; made from quartered split long bone (Fig. 67, *c*)..... 1
From Pit-house D, Promontory
Length, 20 cm.

BONE DIE

(Fig. 67)

Roughly rectangular piece of bone with one curved end and side; flat on one surface, slightly convex on other; flat surface scratched diagonally..... 1
From Pit-house A, Promontory
Length, 6.8 cm.; width, 5.5 cm.; thickness, 2.1 cm.

WORKED HUMAN BONE

(Fig. 67)

Tarsal with hole drilled into distal end..... 1
From Room B with Burial 3, Oak Springs Pueblo
Length, 5.5 cm.; width, 2.3 cm.; thickness, 1.5 cm.

DATA ON IDENTIFIABLE UNWORKED BONE FRAGMENTS*

	Number of Fragments			
	Promontory	Turkey Foot	Twin Bridges	Oak Springs
Homo sapiens	3	..	.	.
Lepus (sp.), possibly jack-rabbit	..	1	.	1
Meleagris gallopavo (turkey)	3	2	1	.
Odocoileus hemionus (mule deer)	18	17	3	2
Odocoileus virginianus (white-tailed deer)	2	3	1	.
Sylvilagus (sp.), cotton-tail	..	..	1	.
Unidentifiable fragments	23	38	.	.

* Identification of the unworked bone and bone used in the bone implements was made by Mrs. Dorothy Foss, Department of Zoology, Chicago Natural History Museum.

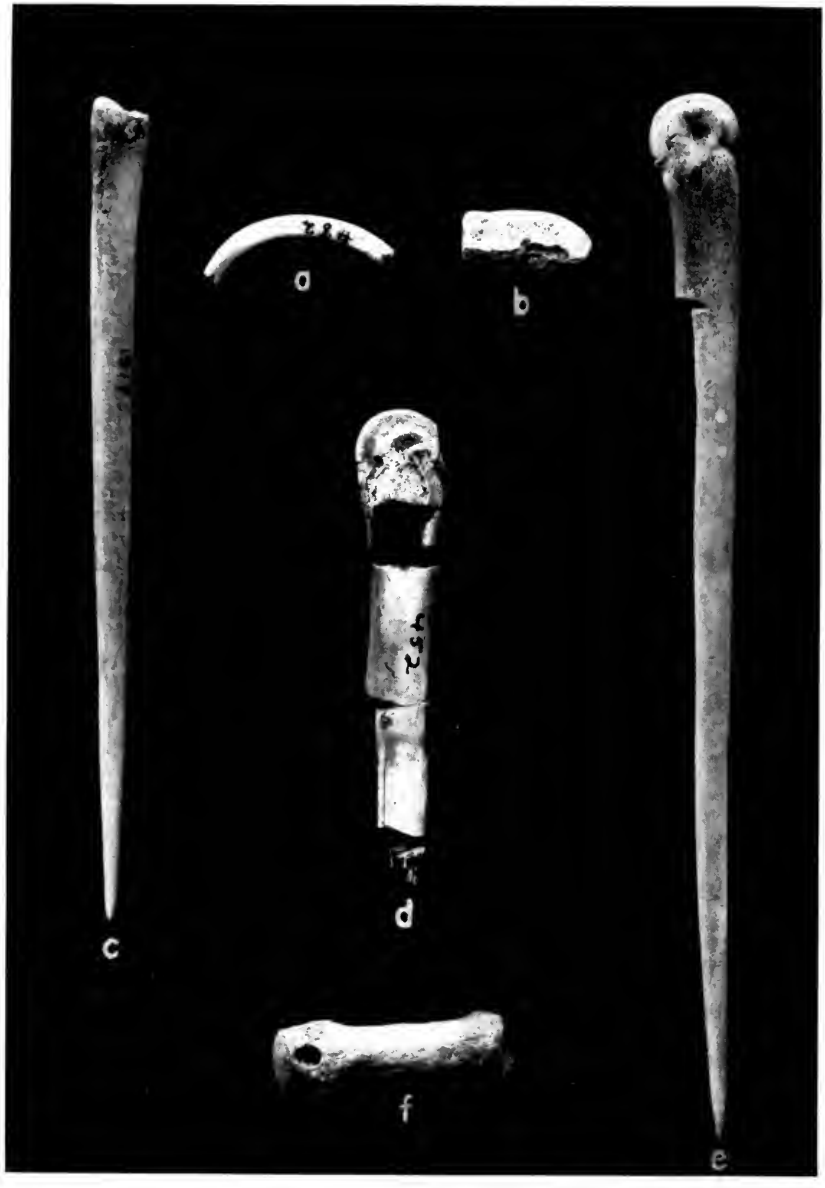


FIG. 67. Bone and shell artifacts. *a*, bracelet fragment; *b*, bone die; *c–e*, bone awls; *f*, perforated human tarsal. Length of *c*, 20 cm.

WORKED SHERDS

(Fig. 68)

(a) Small pottery disks with edges ground smooth (Fig. 68, *a*, *e*)..... 14
From Pit-houses A, B, D, Promontory; A, B, Turkey Foot Ridge; Rooms B, F, Oak Springs Pueblo
Diameter: maximum, 4.9 cm.; minimum, 2.5 cm.; average, 3.6 cm.
Material: Alma Plain

(b) Rectangular worked sherds with edges ground smooth and corners rounded off (Fig. 68, *c*)..... 2
From Pit-house D, Twin Bridges
Lengths, 2.8, 5.0 cm.; widths, 2.7, 5.0 cm.

(c) Oval shape with edges ground smooth (Fig. 68, *g*)..... 1
From Pit-house A, Turkey Foot Ridge
Length, 6.8 cm.; width, 3.5 cm.; thickness, 0.4 cm.
Material: Three Circle Red-on-White

(d) Keystone-shaped sherd with edges ground smooth; too small and flat for scoop (Fig. 68, *d*)..... 1
From Pit-house B, Turkey Foot Ridge
Length, 2.7 cm.; width, 2.4 cm.; thickness, 0.5 cm.
Material: Alma Plain

(e) Large pottery disk with edges ground smooth, perforated near center; possibly spindle whorl (Fig. 68, *i*)..... 1
From Pit-house B, Turkey Foot Ridge
Diameter: 5.0 cm.
Material: Alma Plain

(f) Large, roughly rectangular sherd with edges ground smooth on three sides; deeply concave; possibly scoop (Fig. 68, *j*)..... 1
From Pit-house D, Twin Bridges
Length, 15.1 cm.; width, 12.1 cm.; thickness, 0.3 cm.
Material: Three Circle Red-on-White

ANIMAL EFFIGY

(Fig. 68)

Quadruped of coarse, thickly tempered clay; head, two legs, and part of tail missing..... 1
From Room B with Burial 3, Oak Springs Pueblo
Length, 5.2 cm.; width, 2.4 cm.; thickness, 2.8 cm.

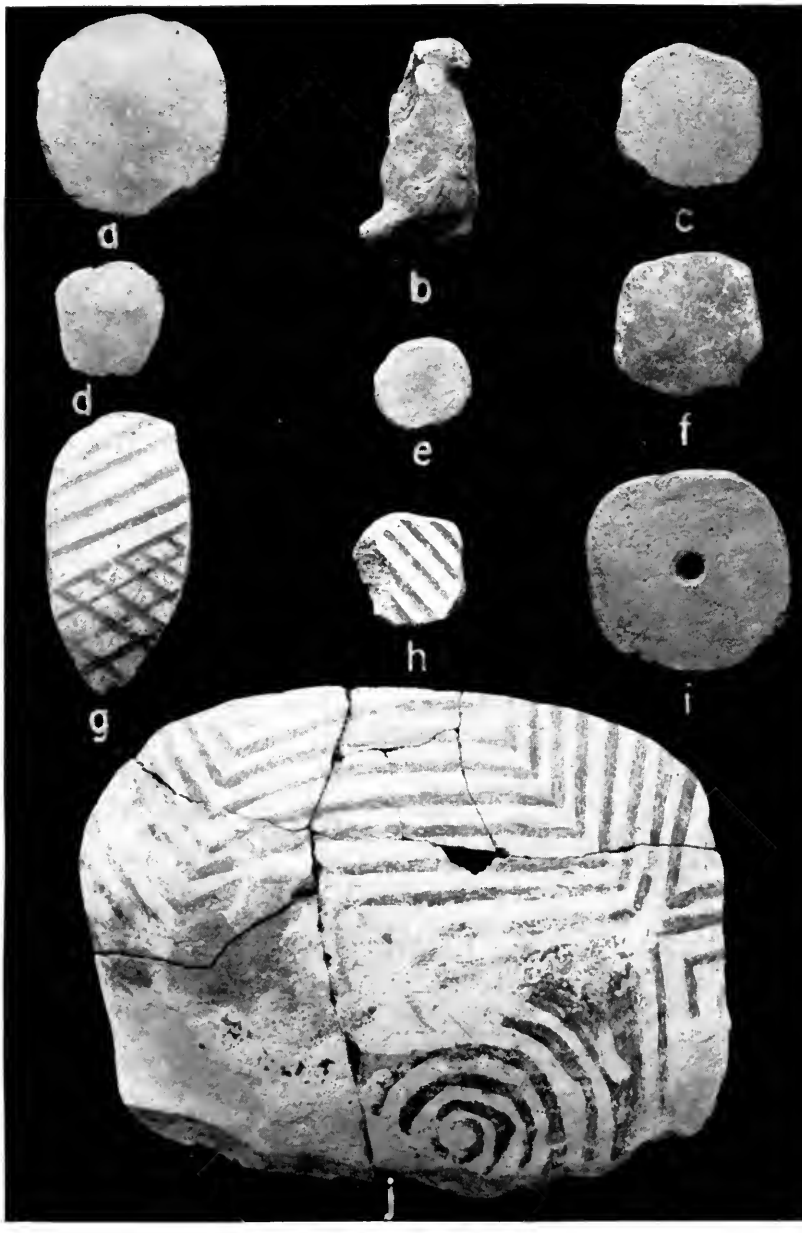


FIG. 68. Animal effigy fragment (*b*) and worked sherds.

TABLE 3.—FREQUENCIES OF OCCURRENCE OF ARTIFACTS IN PIT-HOUSES

SU Site

ARTIFACT TYPE	A	1	R	S	J	U	H	Q	F	P	2	Z	G	L	T	I	D	O	B	M	C	E	N
Manos	1	1	6	13	11	12	8	15	9	4	9	2	5	5	21	9	19	1	7	9	11	7	13
Single grinding surface	1	1	5	13	11	11	8	13	9	4	7	2	4	5	19	6	19	1	7	8	7	7	12
Oblong	1	.	1	1	6	..	5	1	3	1	3	.	2	3	1	2	14	1	.	5	3	2	5
Oval	.	.	2	8	2	6	1	2	2	1	4	1	..	1	5	1	3	.	6	.	..	3	4
Round	.	1	.	1	..	..	.	1	.	.	..	1	..	..	..	..	..	.	1	2	3	1	..
Rectangular	.	.	2	2	3	2	2	7	.	1	..	.	..	..	7	3	..	.	.	.	..	.	3
Roughly square	.	.	.	1	..	3	.	..	.	1	..	.	..	1	3	..	..	.	.	1	..	.	..
Turtleback	.	.	.	..	..	..	.	1	4	.	..	.	2	..	..	..	2	.	.	.	1	1	..
Asymmetrical	.	.	.	..	..	..	.	1	.	.	..	.	..	..	3	..	..	.	.	.	..	.	..
Two grinding surfaces	.	.	1	..	..	1	.	2	.	.	2	.	1	..	2	3	..	.	.	1	4	.	1
Round	.	.	.	..	..	..	.	..	.	.	1	.	..	..	..	1	..	.	.	.	..	.	..
Oval	.	.	.	..	..	1	.	..	.	.	1	.	..	..	1	1	..	.	.	1	4	.	1
Rectangular	.	.	1	..	..	..	.	1	.	.	..	.	1	..	1	1	..	.	.	.	..	.	..
Roughly square	.	.	.	..	..	..	.	1	.	.	..	.	..	..	..	..	..	.	.	.	..	.	..
Rubbing stones	.	.	2	5	3	8	4	..	5	4	8	.	3	6	4	3	3	.	9	4	4	7	9
Single rubbing surface	.	.	2	4	3	6	3	..	2	3	6	.	2	6	3	2	3	.	9	3	4	5	6
Oval	.	.	2	..	1	3	.	..	2	.	1	.	2	1	1	..	3	.	8	3	4	5	3
Roughly round	.	.	.	4	2	2	2	..	.	1	5	.	..	2	1	2	..	.	1	.	..	.	3
Oblong	.	.	.	..	..	..	1	..	.	2	..	.	..	3	1	..	..	.	.	.	.	.	..
Roughly square	.	.	.	..	..	1	.	..	.	.	..	.	..	..	..	..	..	.	.	.	..	.	..
Two rubbing surfaces	.	.	.	1	..	2	1	..	3	1	2	.	1	..	1	1	..	.	.	1	..	2	3
Oval	.	.	.	..	..	..	1	..	.	1	2	.	..	..	1	1	..	.	.	1	..	.	1
Oblong	.	.	.	1	..	2	.	..	3	.	..	.	1	..	..	..	..	.	.	.	..	2	2
Metates	1	1	2	4	2	3	1	4	4	5	1	.	4	1	6	6	8	3	1	1	2	.	8
Slab	.	.	.	1	..	1	.	3	.	3	..	.	2	1	3	4	5	2	.	1	2	.	3
Basin	.	1	.	2	..	1	.	..	2	2	1	.	1	..	1	1	1	.	1	.	..	.	3
Trough closed at one end	1	.	.	1	2	1	1	1	2	.	..	.	1	..	2	1	1	1	.	.	..	.	2
Trough open at both ends	.	.	.	..	..	..	.	..	.	.	..	.	..	..	..	..	1	.	.	.	..	.	..
Small metate-like stones	.	.	1	1	1	7	.	6	.	6	3	.	..	..	1	1	..	6	.	2	..	.	2
Single grinding surface	.	.	1	1	1	3	.	6	.	5	3	.	..	..	1	1	..	4	.	2	..	.	1
Two grinding surfaces	.	.	.	..	..	4	.	..	.	1	..	.	..	..	..	..	..	2	.	.	..	.	1
Mortars	2	.	.	2	5	8	7	4	8	4	..	.	11	..	4	..	5	1	1	3	..	1	6
Pebble	2	.	.	2	5	8	5	4	7	4	..	.	9	..	4	..	3	1	1	3	..	1	6
Metate boulder mortar	.	.	.	..	..	..	2	..	1	.	..	.	2	..	..	..	2	.	.	.	..	.	..

TABLE 3.—FREQUENCIES OF OCCURRENCE OF ARTIFACTS IN PIT-HOUSES—*continued*

SU Site

ARTIFACT TYPE	A	1	R	S	J	U	H	Q	F	P	2	Z	G	L	T	I	D	O	B	M	C	E	N
Pestles	.	.	2	4	2	4	1	4	8	8	5	.	3	8	2	1	2	2	4	.	1	3	10
Angular	.	.	2	2	1	1	.	4	2	3	2	.	1	2	1	1	2	.	3	.	..	1	4
Multifaced	.	.	.	2	1	3	1	..	4	5	2	.	2	6	1	..	..	2	1	.	1	2	6
Cylindrical	.	.	.	..	..	..	.	..	2	.	1	.	..	..	..	..	..	.	.	.	..	.	..
Stone dishes	.	.	.	..	..	..	.	..	1	1	2	.	..	3	..	..	3	.	.	.	..	1	2
Polishing stones	.	.	1	4	6	2	1	3	.	2	10	.	4	12	2	3	5	5	7	8	8	2	29
Hammerstones	.	.	6	3	4	8	.	2	.	5	8	.	..	5	2	2	5	4	.	3	..	.	8
Mauls	1	.	2	3	1	4	.	1	3	2	2	.	2	4	3	3	2	.	3	4	2	1	3
Oval full groove	1	.	1	3	1	4	.	1	3	2	2	.	2	4	3	3	1	.	1	4	1	1	3
Oval three-fourths groove	.	.	1	..	..	..	.	..	.	.	..	.	..	..	..	..	1	.	.	.	1	.	..
Rectangular full groove	.	.	.	..	..	..	.	..	.	.	..	.	..	..	..	..	..	.	.	.	..	.	..
Pipes	.	.	.	2	..	..	1	1	2	.	1	.	1	1	2	3	1	.	.	.	2	1	3
Tubular	.	.	.	1	..	..	1	1	1	.	1	.	..	..	2	3	1	.	.	.	1	1	3
Cloud blower conical	.	.	.	1	..	..	.	..	1	.	..	.	1	1	..	..	..	.	.	.	1	.	..
Projectile points	1	1	1	2	1	3	2	1	2	2	1	.	2	2	1	4	3	1	5	4	10	1	12
Lateral notch	.	.	.	1	..	..	.	1	.	.	..	.	1	..	..	1	1	.	2	1	2	.	..
Diagonal notch	.	.	.	..	..	1	1	..	2	1	..	.	..	1	..	1	..	.	.	.	..	.	1
Short leaf shape	.	.	.	..	..	..	.	..	.	.	..	.	1	..	..	1	1	1	1	1	3	.	1
Leaf shape, base straight	.	.	1	1	..	..	.	..	.	.	..	.	..	..	..	1	..	.	1	.	2	.	2
Slender corner notch	1	1	.	..	..	2	1	..	.	1	1	.	..	..	1	..	1	.	1	2	3	1	8
Knives	1	.	.	1	..	4	3	..	.	6	6	.	..	3	..	8	1	1	1	1	1	3	12
Random plano-convex	1	.	.	1	..	3	2	..	.	6	6	.	..	2	..	7	1	1	1	1	1	1	11
Blades	.	.	.	..	..	1	1	..	.	.	..	.	..	1	..	1	..	.	.	.	..	2	1
Scrapers	.	.	1	1	2	3	9	..	1	5	8	1	..	3	2	6	..	5	1	5	..	1	24
Random thick flakes	.	.	1	1	1	3	9	..	1	5	6	1	..	3	2	4	..	2	1	4	..	1	21
Large rough thick flakes	.	.	.	..	1	.	.	..	.	.	2	.	..	..	..	2	..	3	.	1	..	.	3
Choppers	.	.	2	3	..	1	.	2	.	2	2	.	..	1	3	2	..	1	2	.	3	.	1
Paint grinding stones	1	.	2	1	1	1	.	..	1	.	1	.	..	1	..	2	3	.	.	1	..	1	..
Bone awls	.	.	.	2	..	1	.	..	.	1	4	.	..	2	2	11	1	.	.	.	6	6	1
Head of bone unworked	.	.	.	1	..	1	.	..	.	1	2	.	..	2	2	6	1	.	.	.	1	6	1
Others	.	.	.	1	..	..	.	..	.	.	2	.	..	..	..	5	..	.	.	.	5	.	..

TABLE 3.—FREQUENCIES OF OCCURRENCE OF ARTIFACTS IN PIT-HOUSES—*continued*

ARTIFACT TYPE	*Promontory*				*Turkey Foot Ridge*		*Twin Bridges*				*SU*			*Oak Springs*			
	C	A	E	D	A	B	A	B	D	C	Y	W	X	A	B	C	F
Manos	17	7	.	..	3	31	1	.	14	4	2	16	14	.	1	1	2
Single grinding surface	17	6	.	..	3	30	1	.	11	3	1	14	14	.	.	1	2
Oblong	11	5	.	..	1	3	.	.	5	2	.	2	7	.	.	.	2
Oval	..	..	.	..	1	13	.	.	2	1	.	5	2	.	.	1	.
Round	..	..	.	..	..	2	.	.	2	.	1	1	..	.	.	.	.
Rectangular	3	1	.	..	1	9	1	.	..	.	.	5	3	.	1	.	.
Roughly square	1	..	.	..	..	..	.	.	..	.	.	1	..	.	.	.	.
Turtleback	..	..	.	..	..	2	.	.	1	.	.	..	2	.	.	.	.
Asymmetrical	2	..	.	..	..	1	.	.	1	.	.	..	..	.	.	.	.
Two grinding surfaces	..	1	.	..	..	1	.	.	3	1	1	2	..	.	.	.	.
Round	..	..	.	..	..	..	.	.	1	.	1	..	..	.	.	.	.
Oval	..	..	.	..	..	..	.	.	2	.	.	..	..	.	.	.	.
Rectangular	..	1	.	..	..	..	.	.	..	1	.	2	..	.	.	.	.
Roughly square	..	..	.	..	..	1	.	.	..	.	.	..	..	.	.	.	.
Rubbing stones	5	3	.	..	2	9	.	.	3	.	.	2	1	.	1	.	1
Single rubbing surface	5	3	.	..	2	8	.	.	2	.	.	2	1	.	1	.	1
Oval	3	..	.	..	2	6	.	.	2	.	.	..	1	.	.	.	.
Roughly round	1	2	.	..	..	1	.	.	..	.	.	1	..	.	.	.	.
Oblong	1	..	.	..	..	..	.	.	..	.	.	..	..	.	1	.	1
Roughly square	1	1	.	..	..	1	.	.	..	.	.	1	..	.	.	.	.
Two rubbing surfaces	..	..	.	..	..	1	.	.	1	.	.	..	..	.	.	.	.
Oval	..	..	.	..	..	..	.	.	..	.	.	..	..	.	.	.	.
Oblong	..	..	.	..	..	1	.	.	1	.	.	..	..	.	.	.	.
Metates	1	1	.	1	4	9	.	.	2	.	.	4	..	.	.	.	.
Slab	1	1	.	..	1	4	.	.	..	.	.	..	..	.	.	.	.
Basin	..	..	.	1	..	..	.	.	..	.	.	..	..	.	.	.	.
Trough closed at one end	..	..	.	..	1	1	.	.	..	.	.	3	..	.	.	.	.
Trough open at both ends	..	..	.	..	2	4	.	.	2	.	.	1	..	.	.	.	.
Small metate-like stones	..	..	.	..	3	2	.	.	..	.	.	1	2	.	.	.	.
Single grinding surface	..	..	.	..	3	6	.	.	..	.	.	1	1	.	.	.	.
Two grinding surfaces	..	..	.	..	..	..	.	.	..	.	.	..	1	.	.	.	.
Mortars	..	1	.	1	..	..	.	.	..	.	3	1	..	.	.	.	.
Pebble	..	1	.	..	..	..	.	.	..	.	3	1	..	.	.	.	.
Metate boulder mortar	..	..	.	1	..	..	.	.	..	.	.	..	..	.	.	.	.

TABLE 3.—FREQUENCIES OF OCCURRENCE OF ARTIFACTS IN PIT-HOUSES—*concluded*

ARTIFACT TYPE	*Promontory*				*Turkey Foot Ridge*		*Twin Bridges*				*SU*			*Oak Springs*			
	C	A	E	D	A	B	A	B	D	C	Y	W	X	A	B	C	F
Pestles	1	2	.	..	1	3	.	.	1	.	.	1	1	.	.	.	.
Angular	..	..	.	..	1	..	.	.	..	.	.	1	1	.	.	.	.
Multifaced	1	2	.	..	..	3	.	.	1	.	.	..	..	.	.	.	.
Cylindrical	..	..	.	..	..	..	.	.	..	.	.	..	..	.	.	.	.
Stone dishes	..	2	.	..	..	..	.	.	..	.	.	..	..	.	.	.	.
Polishing stones	10	17	.	4	..	17	3	.	1	1	1	..	..	.	1	.	.
Hammerstones	2	1	.	1	..	3	.	.	..	.	1	1	1	.	.	.	.
Mauls	..	..	.	..	..	..	.	.	..	.	1	..	..	.	.	.	.
Oval full groove	..	..	.	..	..	..	.	.	..	.	.	..	..	.	.	.	.
Oval three-fourths groove	..	..	.	..	..	..	.	.	..	.	.	..	..	.	.	.	.
Rectangular full groove	..	..	.	..	..	..	.	.	..	.	1	..	..	.	.	.	.
Pipes	1	1	.	..	..	..	.	.	..	.	1	1	..	.	.	.	.
Tubular	1	1	.	..	..	..	.	.	..	.	.	1	..	.	.	.	.
Cloud blower conical	..	..	.	..	..	..	.	.	..	.	1	..	..	.	.	.	.
Projectile points	1	2	1	..	..	2	.	.	..	.	1	..	2	1	1	.	.
Lateral notch	1	..	1	..	..	1	.	.	..	.	.	..	2	1	.	.	.
Diagonal notch	..	..	.	..	..	..	.	.	..	.	.	..	..	.	.	.	.
Short leaf shape	..	..	.	..	..	..	.	.	..	.	.	..	..	.	.	.	.
Leaf shape, base straight	..	2	.	..	..	..	.	.	..	.	.	..	..	.	.	.	.
Slender corner notch	..	..	.	..	..	..	.	.	..	.	1	..	..	.	1	.	.
Knives	14	17	1	4	10	8	2	.	..	1	.	1	2	1	2	.	.
Random plano-convex	14	17	1	4	8	8	2	.	..	1	.	..	2	1	2	.	.
Blades	..	..	.	..	2	..	.	.	..	.	.	1	..	.	.	.	.
Scrapers	21	31	4	19	16	7	1	2	..	.	1	1	5	4	8	.	3
Random thick flakes	18	24	4	18	15	7	1	2	..	.	1	1	4	4	8	.	2
Large rough thick flakes	3	7	.	1	1	..	.	.	..	.	.	..	1	.	.	.	1
Choppers	4	..	.	..	1	..	.	.	..	.	.	..	..	.	.	.	.
Paint grinding stones	..	..	.	..	..	..	.	.	..	.	.	..	..	.	.	.	.
Bone awls	..	..	.	2	..	1	.	.	..	.	2	1	..	.	.	.	.
Head of bone unworked	..	..	.	1	..	1	.	.	..	.	1	1	..	.	.	.	.
Others	..	..	.	1	..	..	.	.	..	.	1	..	..	.	.	.	.

VIII. POTTERY

Four sites, representing the Pine Lawn, Three Circle, and Reserve phases, were excavated in the Pine Lawn Valley in 1947, and 10,016 sherds were recovered.

In this chapter, the pottery will be treated by phases under the headings "Painted" and "Plain."

In addition to these descriptions we shall present the following:

1. A tabulation of frequencies and percentages of all pottery types from all excavated houses (Tables 4–7).

2. A chart showing the relationships of the principal pottery types in pit-houses of the Mimbres branch of the Mogollon culture (Fig. 71).

POTTERY OF THE PINE LAWN PHASE

A. *Painted Wares.* Painted pottery does not occur in this phase.

B. *Plain Wares.* At Promontory site, four pit-houses were completely dug and one was trenched. A total of 4,098 sherds was recovered. Three types of Plain wares were found: Alma Plain, Alma Rough, and San Francisco Red, Saliz variety (see Table 4 for details). A fairly complete description of these types has been given in previous reports (Martin, 1940, pp. 78–84, and 1943, pp. 236–249; Martin and Rinaldo, 1947, pp. 362–374). Excellent descriptions are also given by Haury (1936b and 1940). There are no new details to add to these descriptions.

POTTERY OF THE THREE CIRCLE PHASE

(Fig. 69)

A total of 5,387 sherds was recovered from the six pit-houses that were assigned to the Three Circle phase (Turkey Foot and Twin Bridges sites; Table 5).

A. *Painted Wares.* The three principal and characteristic types are the following:

(1) Mogollon Red-on-Brown (Haury, 1936b).

(2) Three Circle Red-on-White (Haury, 1936b).

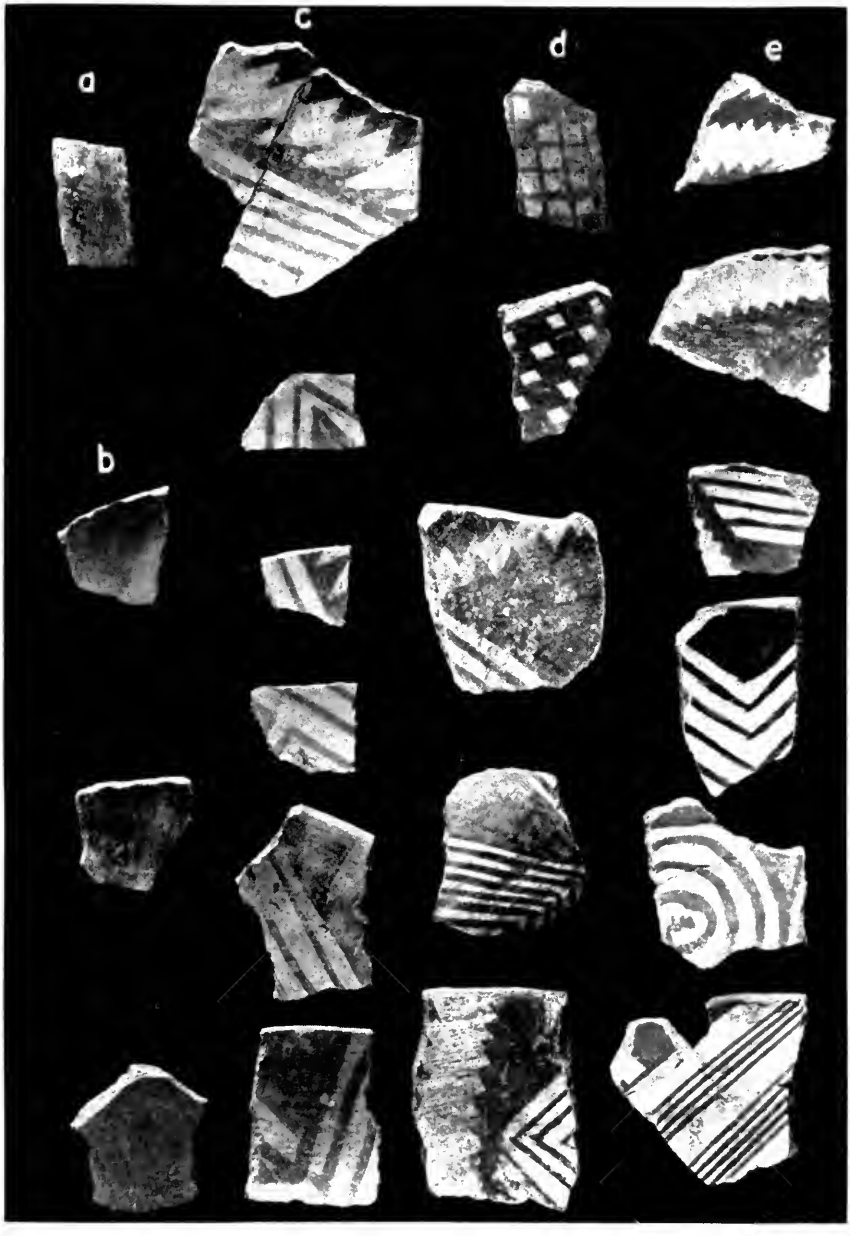


FIG. 69. Pottery sherds. *a*, Abajo Red-on-Orange; column *b*, San Lorenzo Red-on-Brown; column *c*, Mogollon Red-on-Brown; column *d*, Three Circle Red-on-White; column *e*, Mimbres Bold Face Black-on-White.

TABLE 4.—SHERD ANALYSIS, PINE LAWN PHASE

Promontory Site

	TRENCHES		FILL		FLOOR		TOTAL	
	No.	%	No.	%	No.	%	No.	%
Pit-house A								
Alma Plain	698	68.97	271	59.04	378	77.31	1,347	68.73
Alma Rough	75	7.41	52	11.33	7	1.43	134	6.83
San Francisco Red (Saliz variety)	239	23.62	136	29.63	104	21.26	479	24.44
Total	1,012	100.00	459	100.00	489	100.00	1,960	100.00
Pit-house B								
Alma Plain	413	84.11	...	.....	...	.....	413	84.11
Alma Rough	7	1.43	...	.....	...	.....	7	1.43
San Francisco Red (Saliz variety)	71	14.46	...	.....	...	.....	71	14.46
Total	491	100.00	...	.....	...	.....	491	100.00
Pit-house C								
Alma Plain	211	86.48	185	75.21	202	79.21	598	80.26
Alma Rough	16	6.55	28	11.38	6	2.35	50	6.72
San Francisco Red (Saliz variety)	17	6.97	33	13.41	47	18.44	97	13.02
Total	244	100.00	246	100.00	255	100.00	745	100.00
Pit-house D								
Alma Plain	152	59.84	103	66.88	184	73.31	439	66.62
Alma Rough	15	5.91	3	1.95	2	0.79	20	3.03
San Francisco Red (Saliz variety)	87	34.25	48	31.17	65	25.90	200	30.35
Total	254	100.00	154	100.00	251	100.00	659	100.00
Pit-house E								
Alma Plain	...	.....	83	63.36	88	78.57	171	70.37
Alma Rough	...	.....	8	6.10	1	0.90	9	3.70
San Francisco Red (Saliz variety)	...	.....	40	30.54	23	20.53	63	25.93
Total	...	.....	131	100.00	112	100.00	243	100.00

(3) Mimbres Bold Face (Cosgrove, H. S. and C. B., 1932; and Haury, 1936b).

These three types, as identified by sherds, agree completely with Haury's descriptions (shapes, designs, color of paints, and treatment). Our Mimbres Bold Face differs somewhat from the same type as illustrated by Cosgrove (1932). The designs on the Pine Lawn Valley Mimbres Bold Face are crudely executed. The paint is usually chocolate brown or black, and the designs are similar to those of the ancestral type, Three Circle Red-on-White.

There is certainly no doubt in our minds that Haury was correct when he stated that Mogollon Red-on-Brown gave birth to several other types, namely, Three Circle Red-on-White and Mimbres Bold Face Black-on-White. Our work confirms this thesis. Furthermore, it is very difficult for us to draw a hard and fast line, on the one hand,

between some sherds of Mogollon Red-on-Brown and Three Circle Red-on-White, and, on the other hand, between sherds of Three Circle Red-on-White and Mimbres Bold Face.

Furthermore, at the Swarts Ruin in the Mimbres Valley, it is fairly evident, from an analysis of designs, that Mimbres Bold Face Black-on-White developed into Mimbres Classic Black-on-White. While both these types occur in Pine Lawn Valley, their design relationship is not so clear.

Some other types of painted pottery—San Lorenzo Red-on-Brown, Red Mesa Black-on-White, Reserve Black-on-White, Tularosa Black-on-White, Abajo Red-on-Orange—were found in the Three Circle houses but in negligible quantities (see Table 5).

Attention is called to the Red Mesa Black-on-White pottery, a type that dates from about A.D. 900 (Gladwin, 1945), and to the Abajo Red-on-Orange sherd, a type that dates from about A.D. 750 (Martin, 1939) or A.D. 780 (Brew, 1946) to A.D. 870 (Martin, 1939) (see discussion of Abajo Red-on-Orange in this chapter, p. 202).

Haury (1936a) dated the Three Circle phase at about A.D. 900–1000. The presence of the two last-named pottery types tends to confirm this estimate.

It might also be noted that Haury has conjectured that the scrolls found on Three Circle Red-on-White pottery may have been borrowed from the Hohokam people. We found nothing to confirm or contradict this guess.

B. *Plain Wares.* The characteristic Plain wares are:

(1) Alma Rough (Martin, 1940, 1943; Martin and Rinaldo, 1947).

(2) Alma Plain (Haury, 1936b; Martin, 1940, 1943; Martin and Rinaldo, 1947).

(3) San Francisco Red (Haury, 1936b; Martin, 1940, 1943; Martin and Rinaldo, 1947).

(4) Alma Neck Banded (Haury, 1936b).

(5) Alma Scored (Haury, 1936b).

(6) Three Circle Neck Corrugated (Haury, 1936b).

(7) Reserve Smudged (same as Reserve Plain [Nesbitt, 1938, pp. 97–98], except that Reserve Smudged has no fillets on rim).

A full description of these Plain wares has been given by the authors cited above. The Pine Lawn Valley Plain wares are identical with those described by Haury, Martin, and Nesbitt.

POTTERY OF THE RESERVE PHASE

(Fig. 70)

In the Oak Springs Pueblo, which has been placed in the Reserve phase, 531 sherds were found in the six rooms. The scarcity of pottery from this site is remarkable (see Table 6 for details).

A. *Painted Wares.* The three principal types are:

(1) Reserve Black-on-White (Nesbitt, 1938, p. 138; Roberts, 1940, pp. 71, 138; Martin and Willis, 1940, pp. 165–176).

(2) Mimbres Bold Face Black-on-White (Cosgrove, H. S. and C. B., 1932; Haury, 1936b).

(3) Smudged Decorated; an unnamed and undescribed type; known only from 35 sherds; bowls; exterior, like Alma Plain; interior, a polished black; designs, confined to interior, are matt (compared to polished, smudged background), rectilinear, and resemble late Three Circle Red-on-White and early Bold Face Black-on-White designs. The designs are difficult to see in certain lights because the design elements are grayish black and are almost the same color as the background.

The origin of Reserve Black-on-White is not known. Certainly the designs on it seem to be related to those on Chaco pottery.

B. *Plain Wares.* The six principal types are:

(1) Alma Plain (Haury, 1936b, 1940; Martin and Rinaldo, 1947; Martin, 1940, 1943).

(2) Alma Rough (Martin and Rinaldo, 1947; Martin, 1940, 1943).

(3) San Francisco Red (Haury, 1936b; Martin and Rinaldo, 1947; Martin, 1940, 1943).

(4) Reserve Smudged (same as Reserve Plain [Nesbitt, 1938, pp. 97–98], except that Reserve Smudged has no fillets on rim).

(5) Mimbres Neck Corrugated (Cosgrove, H. S. and C. B., 1932, p. 83).

(6) Incised Corrugated (unnamed and undescribed type. Since we have no whole pieces, we can do no more than mention it.)

A full description of these plain wares (except Incised Corrugated) is given by the authors cited.

Reserve Smudged may have gradually replaced San Francisco Red.

The pueblo in which the pottery of the Reserve phase occurred is Anasazi in character. The Reserve Black-on-White pottery also seems Anasazi. Although Anasazi traits may be detected in earlier

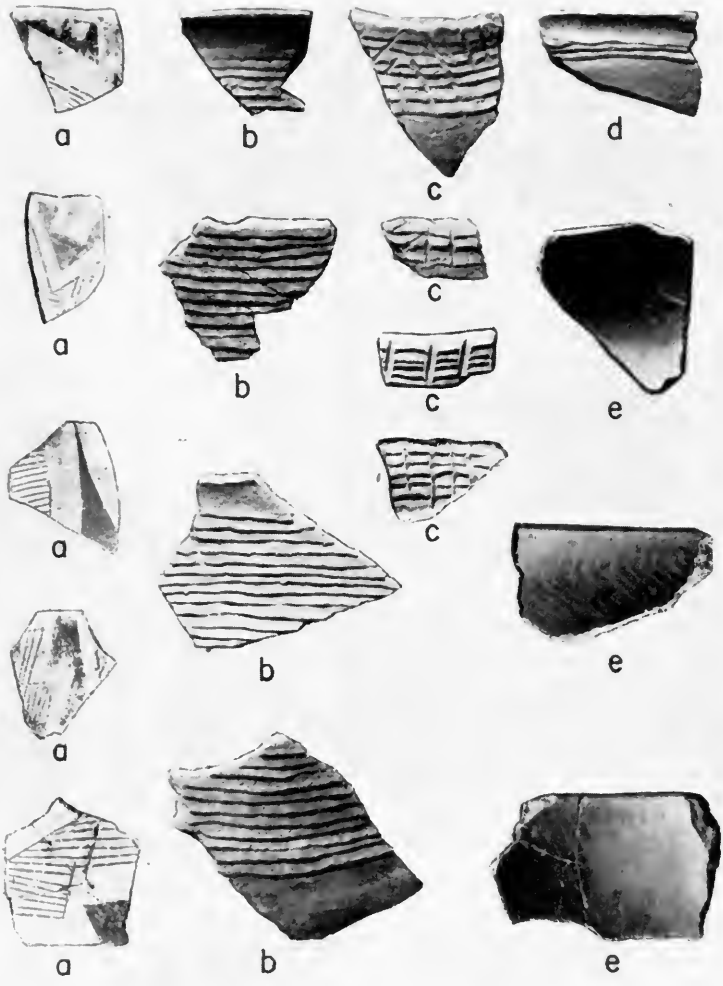


FIG. 70. Pottery sherds. *a*, Reserve Black-on-White; *b*, Mimbres Neck Corrugated; *c*, Incised Corrugated; *d*, Reserve Fillet Rim; *e*, Smudged Decorated.

TABLE 5.—SHERD ANALYSIS, THREE CIRCLE PHASE

Turkey Foot Ridge

	Fill		Floor		Total	
	No.	%	No.	%	No.	%
Pit-house A						
Alma Plain	872	70.72	238	74.37	1,110	71.48
Alma Rough	29	2.35	0	.....	29	1.86
San Francisco Red (Saliz variety)	175	14.19	33	10.31	208	13.39
Reserve Smudged	15	1.21	0	.....	15	0.98
Alma Neck Banded	29	2.35	5	1.56	34	2.19
Alma Scored	2	0.16	1	0.32	3	0.20
Three Circle Neck Corrugated	10	0.82	0	.....	10	0.64
Rubbed Corrugated	1	0.08	0	.....	1	0.06
Mogollon Red-on-Brown	13	1.06	6	1.88	19	1.22
Three Circle Red-on-White	47	3.82	19	5.93	66	4.25
Mimbres Bold Face Black-on-White	38	3.08	18	5.63	56	3.60
Mimbres Classic Black-on-White	2	0.16	0	.....	2	0.13
Total	1,233	100.00	320	100.00	1,553	100.00
Pit-house B						
Alma Plain	1,121	72.27	981	77.80	2,102	74.75
Alma Rough	3	0.19	0	.....	3	0.10
San Francisco Red (Saliz variety)	122	7.86	84	6.66	206	7.33
Reserve Smudged	98	6.31	21	1.67	119	4.23
Alma Neck Banded	19	1.22	12	0.95	31	1.10
Alma Scored	6	0.39	4	0.31	10	0.36
Three Circle Neck Corrugated	33	2.12	6	0.48	39	1.39
Incised Corrugated	1	0.07	0	.....	1	0.04
Indeterminate Corrugated	1	0.07	1	0.08	2	0.07
San Lorenzo Red-on-Brown	1	0.07	2	0.16	3	0.10
Mogollon Red-on-Brown	11	0.71	24	1.90	35	1.25
Three Circle Red-on-White	33	2.12	55	4.36	88	3.13
Mimbres Bold Face Black-on-White	47	3.03	52	4.12	99	3.52
Mimbres Classic Black-on-White	4	0.26	2	0.16	6	0.21
Reserve Black-on-White	1	0.07	1	0.08	2	0.07
Tularosa Black-on-White	1	0.07	1	0.08	2	0.07
Red Mesa Black-on-White	1	0.07	0	.....	1	0.04
Indeterminate Black-on-White	25	1.61	7	0.56	32	1.14
Indeterminate Mimbres Black-on-White	23	1.49	8	0.63	31	1.10
Total	1,551	100.00	1,261	100.00	2,812	100.00

phases in the Pine Lawn Valley (for example, Georgetown, San Francisco and Three Circle), yet in the Reserve phase we can demonstrate stronger Anasazi influences.

RELATIONSHIPS OF PRINCIPAL POTTERY TYPES IN MOGOLLON SITES IN WESTERN NEW MEXICO

(Fig. 71)

As we studied the sherd data from the 1947 dig and compared them with those of 1939, 1941, and 1946, we wondered whether it

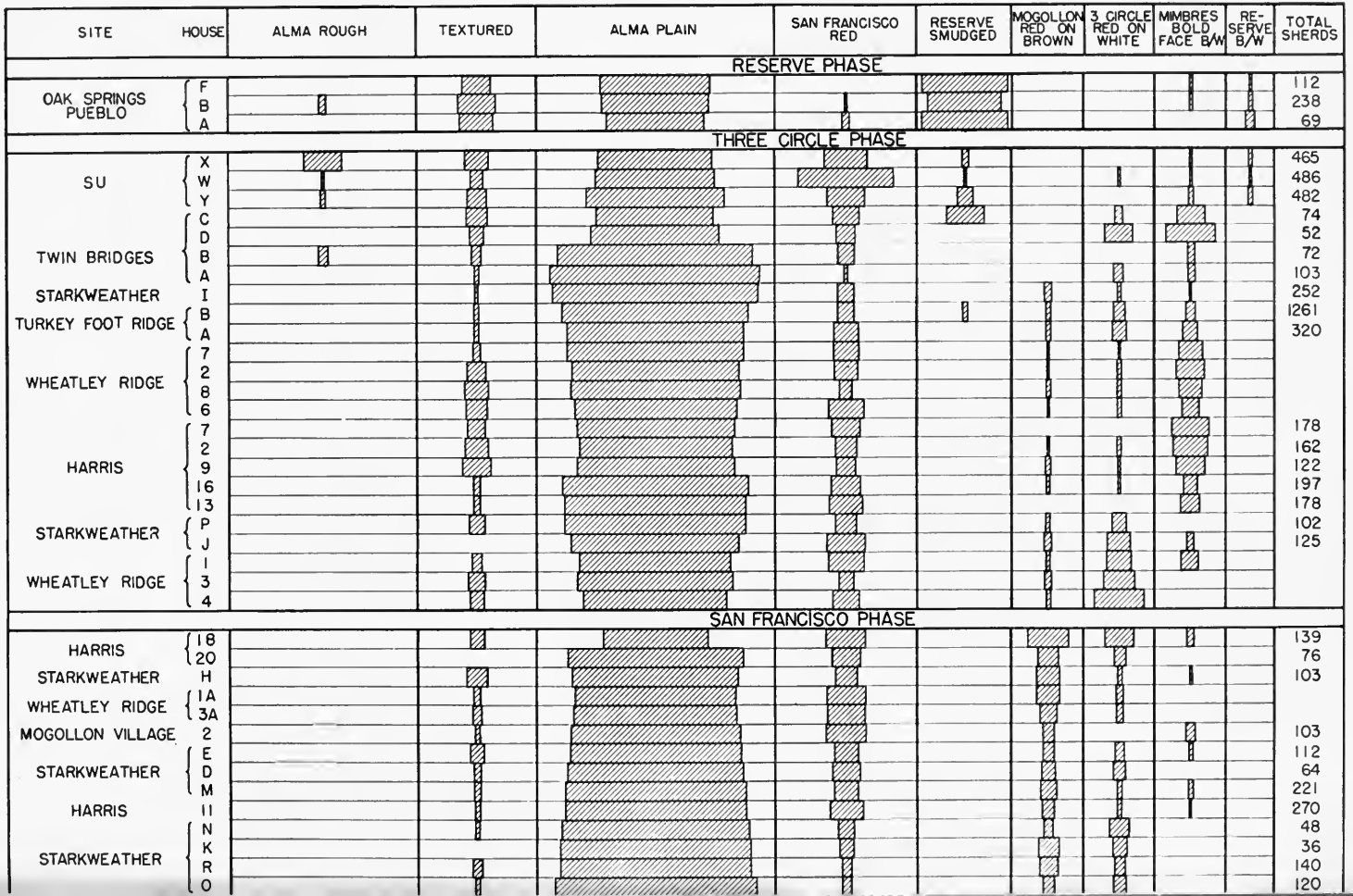
TABLE 5.—SHERD ANALYSIS, THREE CIRCLE PHASE—*concluded*

Twin Bridges

	Fill		Floor		Total	
	No.	%	No.	%	No.	%
Pit-house A						
Alma Plain	61	91.05	31	86.12	92	89.32
Alma Rough	0	.....	0	.....	0	.....
San Francisco Red (Saliz variety)	0	.....	1	2.78	1	0.97
Alma Neck Banded	0	.....	2	5.55	2	1.94
Three Circle Red-on-White	2	2.98	2	5.55	4	3.89
Mimbres Bold Face Black-on-White	3	4.48	0	.....	3	2.91
Abajo Red-on-Orange	1	1.49	0	.....	1	0.97
Total	67	100.00	36	100.00	103	100.00
Pit-house B						
Alma Plain	37	80.43	22	84.61	59	81.94
Alma Rough	2	4.35	1	3.85	3	4.17
San Francisco Red (Saliz variety)	3	6.52	2	7.69	5	6.94
Alma Neck Banded	2	4.35	1	3.85	3	4.17
Mimbres Bold Face Black-on-White	2	4.35	0	.....	2	2.78
Total	46	100.00	26	100.00	72	100.00
Pit-house C						
Alma Plain	76	69.73	36	48.65	112	61.20
Alma Rough	9	8.26	0	.....	9	4.92
San Francisco Red (Saliz variety)	5	4.59	8	10.81	13	7.10
Reserve Smudged	4	3.67	12	16.22	16	8.74
Alma Neck Banded	3	2.75	7	9.46	10	5.47
Three Circle Red-on-White	6	5.50	2	2.70	8	4.37
Mimbres Bold Face Black-on-White	6	5.50	9	12.16	15	8.20
Total	109	100.00	74	100.00	183	100.00
Pit-house D						
Alma Plain	476	77.52	28	53.85	504	75.68
Alma Rough	2	0.33	0	.....	2	0.30
San Francisco Red (Saliz variety)	32	5.21	4	7.69	36	5.41
Alma Neck Banded	27	4.40	3	5.77	30	4.50
Three Circle Red-on-White	28	4.56	6	11.54	34	5.11
Mimbres Bold Face Black-on-White	48	7.82	11	21.15	59	8.85
Indeterminate Black-on-Red	1	0.16	0	.....	1	0.15
Total	614	100.00	52	100.00	666	100.00

would be possible to place the houses in approximate chronological positions. In analyzing the pottery type percentages of the various sites, and in making, in particular, a comparison of the pottery type percentages of the Promontory site (1947) and the SU site (1939, 1941, 1946) it became evident to us that we were dealing with differences of a degree that might cover a span of time within the Pine Lawn phase.

We had conjectured that all the houses at the SU site were not occupied at the same time, although the percentile differences between the pottery types in the individual houses were not great.


SITE
HOUSE
ALMA ROUGH
TEXTURED
ALMA PLAIN
SAN FRANCISCO RED
RESERVE SMUDGED
MOGOLLON RED ON BROWN
3 CIRCLE RED ON WHITE
MIMBRES BOLD FACE B/W
RE-SERVE B/W
TOTAL SHERDS
RESERVE PHASE
OAK SPRINGS PUEBLO
F 112
B 238
A 69
THREE CIRCLE PHASE
SU
X 465
W 486
Y 482
TWIN BRIDGES
C 74
D 52
B 72
A 103
STARKWEATHER
I 252
TURKEY FOOT RIDGE
B 1261
A 320
WHEATLEY RIDGE
7
2
8
6
HARRIS
7 178
2 162
9 122
16 197
13 178
STARKWEATHER
P 102
J 125
WHEATLEY RIDGE
1
3
4
SAN FRANCISCO PHASE
HARRIS
18 139
20 76
STARKWEATHER
H 103
WHEATLEY RIDGE
1A
3A
MOGOLLON VILLAGE
2 103
STARKWEATHER
E 112
D 64
M 221
HARRIS
11 270
STARKWEATHER
N 48
K 36
R 140
O 120

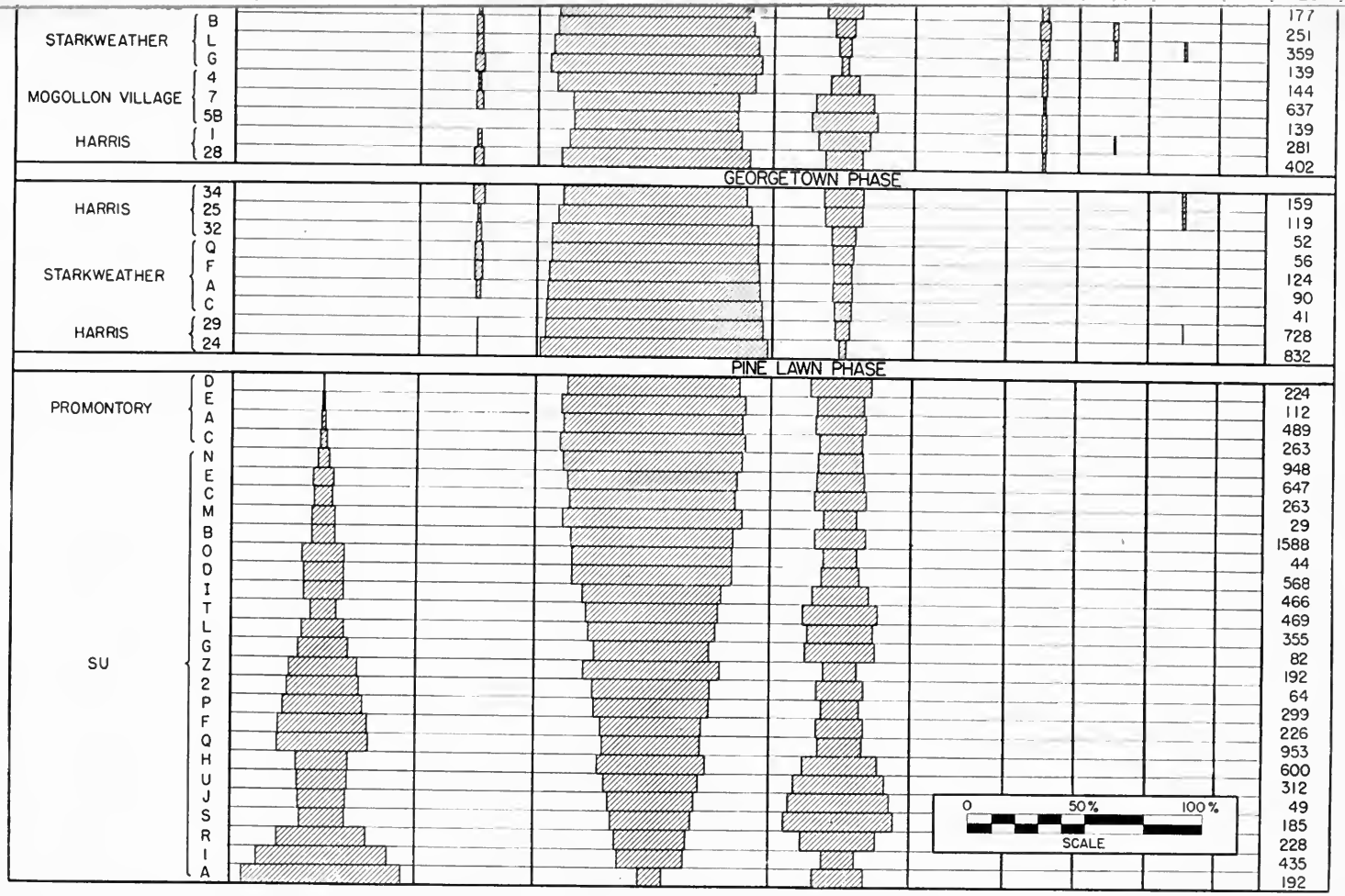


FIG. 71. Chart showing relationships of principal pottery types in Mogollon sites in western New Mexico.

TABLE 6.—SHERD ANALYSIS, RESERVE PHASE

Oak Springs Pueblo

	Floor and Fill		Total	
	No.	%	No.	%
Room A				
Alma Plain	28	40.58	28	40.58
San Francisco Red (Saliz variety)	2	2.90	2	2.90
Reserve Smudged	25	36.23	25	36.23
Mimbres Neck Corrugated	10	14.49	10	14.49
Incised Corrugated	1	1.45	1	1.45
Reserve Black-on-White	3	4.35	3	4.35
Total	69	100.00	69	100.00
Room B				
Alma Plain	107	44.96	107	44.96
Alma Rough	7	2.94	7	2.94
San Francisco Red	2	0.84	2	0.84
Reserve Smudged	73	30.67	73	30.67
Mimbres Neck Corrugated	37	15.55	37	15.55
Incised Corrugated	4	1.68	4	1.68
Mimbres Bold Face Black-on-White	1	0.42	1	0.42
Reserve Black-on-White	6	2.52	6	2.52
Smudged Decorated	1	0.42	1	0.42
Total	238	100.00	238	100.00
Room C				
Alma Plain	11	55.00	11	55.00
Reserve Smudged	6	30.00	6	30.00
Mimbres Neck Corrugated	1	5.00	1	5.00
Reserve Black-on-White	2	10.00	2	10.00
Total	20	100.00	20	100.00

We were struck by the fact that the differences between the Promontory site and the SU site were greater than those within the SU site itself. But we did not feel that these differences were great enough to place the Promontory site in a different phase. For that reason we felt that this degree of difference might be explained by a difference in time. Therefore we cast about for some means of placing the sites, and eventually the houses within the sites, in some sort of approximate chronological sequence.

We had thought (at the end of the 1947 season) that the Promontory site might be earlier than the SU site because the houses of the former were shallower, were irregular in outline, were provided with very uneven floors, and were located on a high point.

In the absence of tree-ring dates, of stratigraphy, and of trade pottery, it was impossible to assign dates to either the SU or the Promontory sites. We were seeking, therefore, a tool for placing these sites, and also the pit-houses within the sites, in sequence.

TABLE 6.—SHERD ANALYSIS, RESERVE PHASE—*concluded*

Oak Springs Pueblo

	Floor and Fill		Total	
	No.	%	No.	%
Room D				
Alma Plain	1	33.33	1	33.33
Reserve Smudged	1	33.33	1	33.33
Reserve Black-on-White	1	33.34	1	33.34
Total	3	100.00	3	100.00
Room E				
Alma Plain	10	23.81	10	23.81
Smudged Decorated	32	76.19	32	76.19
Total	42	100.00	42	100.00
Room F				
Alma Plain	52	46.43	52	46.43
Reserve Smudged	41	36.61	41	36.61
Mimbres Neck Corrugated	14	12.50	14	12.50
Incised Corrugated	1	0.90	1	0.90
Reserve Black-on-White	3	2.66	3	2.66
Indeterminate Black-on-White	1	0.90	1	0.90
Total	112	100.00	112	100.00
Trenches outside pueblo				
Alma Plain		23	46.00	
Reserve Smudged		9	18.00	
Mimbres Neck Corrugated		7	14.00	
Incised Corrugated		5	10.00	
Three Circle Red-on-White		2	4.00	
Reserve Black-on-White		2	4.00	
Smudged Decorated		2	4.00	
Total		50	100.00	

Fortunately, Haury (1936a, 1940, 1942), Nesbitt (1938), and Sayles (1945) had been able, by means of dated trade pottery, stratigraphy, and dendrochronology, to follow the rise and fall of some Mogollon pottery types from one phase to another. They could not, however, ascertain exactly when any given pottery type reached its peak of popularity or whether there were several crests of popularity of a particular type. For example, Haury (1936a) and Nesbitt (1938) discovered that Mogollon Red-on-Brown pottery developed in the San Francisco phase and died out in the Three Circle phase. Their evidence indicated that this pottery type reached its maximum popularity during the San Francisco phase, but it was not clear in what part of the phase the peak occurred or whether there was more than one climax.

Therefore, we hoped to find a method of (1) placing sites in a chronological order within the same phase; (2) of placing houses

in chronological order within a site; and (3) of determining the point in time when any particular pottery type reached its peak.

In seeking, then, trends within pottery types and any other significant observations that might accrue from a comprehensive visual presentation of data, we decided to employ a graphic method similar to that used by James A. Ford and others in their studies of archaeology of the southeastern United States (Ford and Willey, 1940; Ford and Quimby, 1945).

In constructing this graph we made one assumption: that Alma Rough pottery came into being before Alma Plain. We knew from our study of Haury's (1936b) and Nesbitt's (1938) data that Alma Rough pottery did not occur in the Georgetown phase, whereas Alma Plain did.

In addition to this assumption we knew that:

(1) Alma Plain was waning in Georgetown and later periods and was gradually replaced by textured wares.

(2) The sequence of phases in the Mimbres branch from early to late was Pine Lawn (about A.D. 500), Georgetown, San Francisco, Three Circle, and Reserve, and that the phases following Pine Lawn had been established by tree-ring dates and/or stratigraphy.

(3) Painted pottery appeared in the San Francisco phase and increased in popularity to the end of the Mimbres branch.

(4) Mogollon Red-on-Brown pottery appeared in the San Francisco phase and reached its peak during that phase.

(5) Three Circle Red-on-White appeared at the same or at a slightly later time.

(6) Mimbres Bold Face Black-on-White came in during the latter part of the San Francisco phase and reached its peak during the Three Circle phase.

In order to make our analysis as complete as possible, we utilized the data from nine sites: Mogollon 1:15, the Harris Village, the Starkweather site, the Wheatley Ridge site (unpublished MS. by Chandler Rowe), the SU site, the Promontory site, the Turkey Foot Ridge site, the Twin Bridges site, and the Oak Springs Pueblo.

Accordingly, the house that yielded the greatest percentage of Alma Rough pottery was taken as the earliest one in our series of houses (see Fig. 71). The other houses were placed in order above it according to the trends outlined for the various pottery types by Haury and Nesbitt. What we have attempted, therefore, is a seriation of house units based on pottery percentages. It should

be noted that each house was considered as a unit and only on the basis of the percentages of pottery that came from it. In making

FIG. 72. Pottery. *a*, San Francisco Red barrel-shaped jar from Pit-house B, Turkey Foot Ridge site; *b*, Alma Plain globular jar from Pit-house B, Turkey Foot Ridge site; *c*, San Francisco Red bowl from Pit-house A, Promontory site; *d*, Reserve Smudged bowl from Oak Springs Pueblo burial. Diameter of *d*, 28.4 cm.

the graph no consideration was given to sites, phases, tree-ring dates or other knowledge.

After the graph had been finished, houses were grouped by phases according to presence or absence of significant pottery types; and after that the few available tree-ring dates were inserted in the graph to check our deductive, typological chronology. With the exception of House I, Starkweather site, the order in which we had listed the houses checked with the tree-ring dates, and was also corroborated by means of trade pottery and stratigraphy. Origi-

nally we placed House I, Starkweather site, between House 4, Mogollon 1:15, and House G, Starkweather site, but on checking the tree-ring data for House I, we decided that it should be placed in the Three Circle phase rather than in the San Francisco phase.

Deductions from graph (Fig. 71)

(1) That the houses at the SU site were not all occupied at the same time. The village was at first an affair of three or four houses. A sequence of houses was established and we feel fairly confident that it is correct inasmuch as other features (architecture, tools) corroborated our order. We were very surprised to find that the Promontory site is later than the SU site.

(2) That further significant observations concerning architecture and tools of bone and stone could be derived. These will be discussed in the next chapter.

(3) That certain pottery-type trends were evident. These were either refinements of existing knowledge or discoveries of new characteristics of the trends.

a. Popularity of Alma Plain increases as Alma Rough wanes.

b. Alma Plain reached its peak during the early part of the Georgetown phase.

c. The popularity of textured wares (scored, incised, neck corrugated) reached a climax in the Three Circle phase.

d. San Francisco Red apparently reached a peak early in the Pine Lawn phase with an inconstant falling off up to the Reserve phase when its frequency dropped nearly to zero.

e. Reserve Smudged appeared during the Three Circle phase, reached a climax during the Reserve phase, and assumed the former popularity of San Francisco Red.

f. Mogollon Red-on-Brown reached a peak late in the San Francisco phase.

g. Three Circle Red-on-White appeared slightly later than Mogollon Red-on-Brown and reached a climax early in the Three Circle phase.

h. Mimbres Bold Face reached a climax late in the Three Circle phase and disappeared in the Reserve phase.

i. Reserve Black-on-White came in during late Three Circle times, and replaced Mimbres Bold Face. The further history of Reserve Black-on-White we do not yet know.

(4) Deductions as to gaps in the sequence.

a. That there must exist as yet undiscovered pottery-bearing sites or houses older than the earliest SU site houses in which

FIG. 73. Pottery. *a*, San Francisco Red barrel-shaped jar from Pit-house A, Promontory site; *b*, Alma Plain globular jar from Pit-house D, Twin Bridges site; *c*, Incised stone bowl from Pit-house D, Twin Bridges site; *d*, Alma Plain pitcher from Pit-house B, Turkey Foot Ridge site. Diameter of *d*, 7.1 cm. All miniatures.

one would expect to find that Alma Rough would approach 100 per cent of the pottery.

b. That there is a gap in our knowledge as to the transition between the Pine Lawn and Georgetown phases.

c. That there is no gap, as previously thought, between the Georgetown and San Francisco phases, and there is no reason

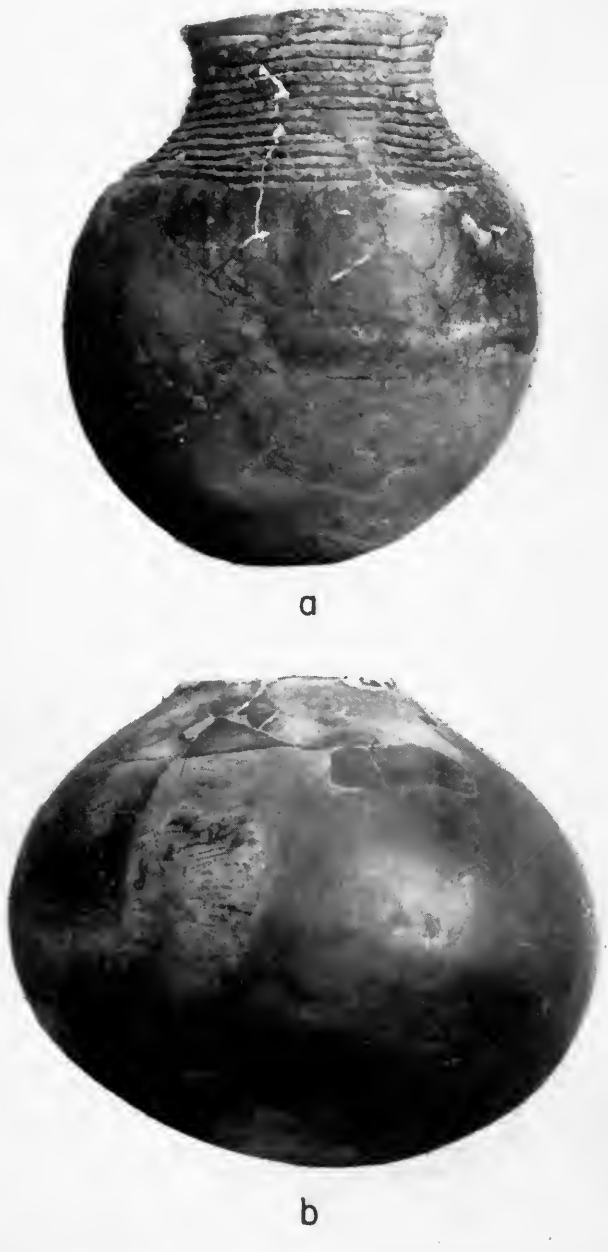


FIG. 74. Pottery. *a*, Alma Neck Banded wide-mouthed jar from Pit-house B, Turkey Foot Ridge site; *b*, San Francisco Red globular jar from Pit-house A, Promontory site. Diameter of *b*, 35.2 cm.

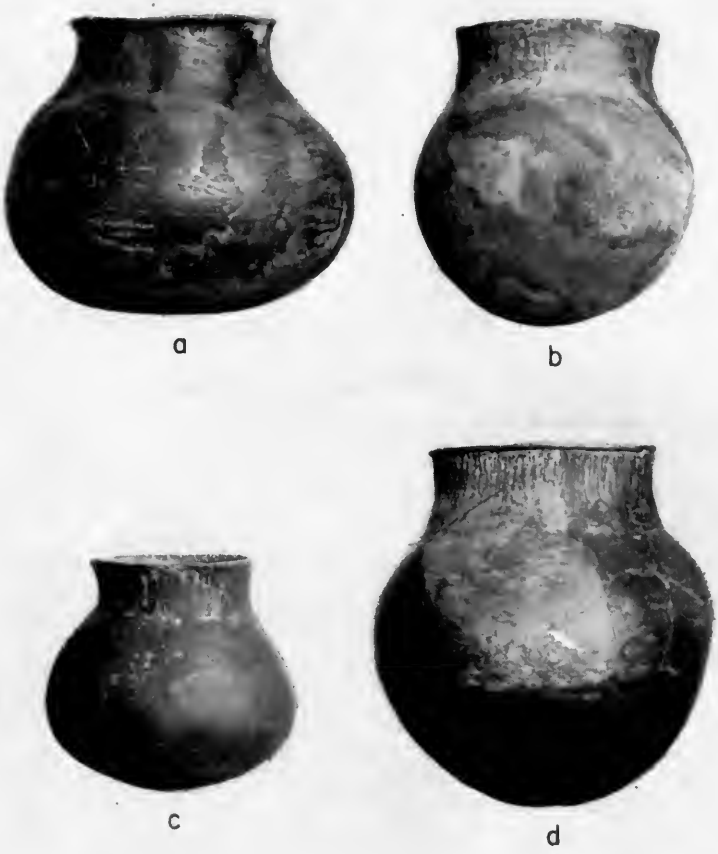


FIG. 75. Wide-mouthed jars. *a*, Alma Plain, from Pit-house B, Turkey Foot Ridge site; *b*, Alma Plain, from Pit-house D, Twin Bridges site; *c*, Alma Scored, from Pit-house C, Twin Bridges site; *d*, Alma Scored, from Pit-house B, Turkey Foot Ridge site. Diameter of *d*, 20.6 cm.

for inserting at that point a San Lorenzo phase in the Mimbres branch, as manifested in the Pine Lawn Valley.

House B of Promontory site appears to fit at the end of the Pine Lawn sequences. We feel, however, that the sherd sample was unreliable because the house was only trenched. It was therefore omitted from the graph. Houses 3 and V of the SU site did not fit in the sequence. What caused the aberration of pottery percentages in these two units is not known. They, too, were omitted.

COMPARISON OF ABAJO RED-ON-ORANGE AND MOGOLLON RED-ON-BROWN

What was the origin of Abajo Red-on-Orange pottery? This question arose again because one sherd was found in Pit-house A, Twin Bridges site, which has been classified as belonging to the Three Circle phase (ca. A.D. 900–1000). No other trade pottery from the Anasazi area was found at this site.

Out of thirty-six design elements on Abajo Red-on-Orange pottery, eight resemble those on Mogollon Red-on-Brown ware. These resemblances are:

Fringed lines: Fig. 4*b*, Haury, 1936b; Figs. 132*l*, 133*m*, Martin, 1939.

Chevrons: Fig. 3*a*, Haury, 1936b; Fig. 133*f*, Martin, 1939.

Regular sawteeth: Fig. 4*f*, Haury, 1936b; Fig. 132*g*, Martin, 1939.

Lattice: Fig. 4*e*, Haury, 1936b; Fig. 132*k*, Martin, 1939.

Concentric circles: Fig. 4*m*, Haury, 1936b; Fig. 131*j*, *l*, Martin, 1939.

Concentric rectangles: Fig. 4*l* and Plate 1*a*, Haury, 1936b; Fig. 137, lower right, Martin, 1939.

Pendent sawteeth: Fig. 3*b*, Haury, 1936b; Fig. 133*b*, Martin, 1939.

Diagonal cribbing: Fig. 4*a*, Haury, 1936b; Fig. 133*d*, Martin, 1939.

The layouts of the designs on Abajo pottery are sometimes like those on Mogollon Red-on-Brown ware and sometimes are like the basketry layouts of early Anasazi painted pottery (Lino Black-on-Gray).

Pottery fired in an oxidizing atmosphere is probably older in the Mogollon than in the Anasazi area (such pottery occurs at the Bluff site [Haury, 1947], which dates from around A.D. 300). One might guess that the custom of oxidizing pottery is generally older in the Mogollon and Hohokam areas than it is in the Anasazi area.

Therefore the whole question is yet not settled. I should be tempted to guess, however, that the idea for oxidizing pottery and for some of the designs on Abajo Red-on-Orange pottery came from the Mogollon area.

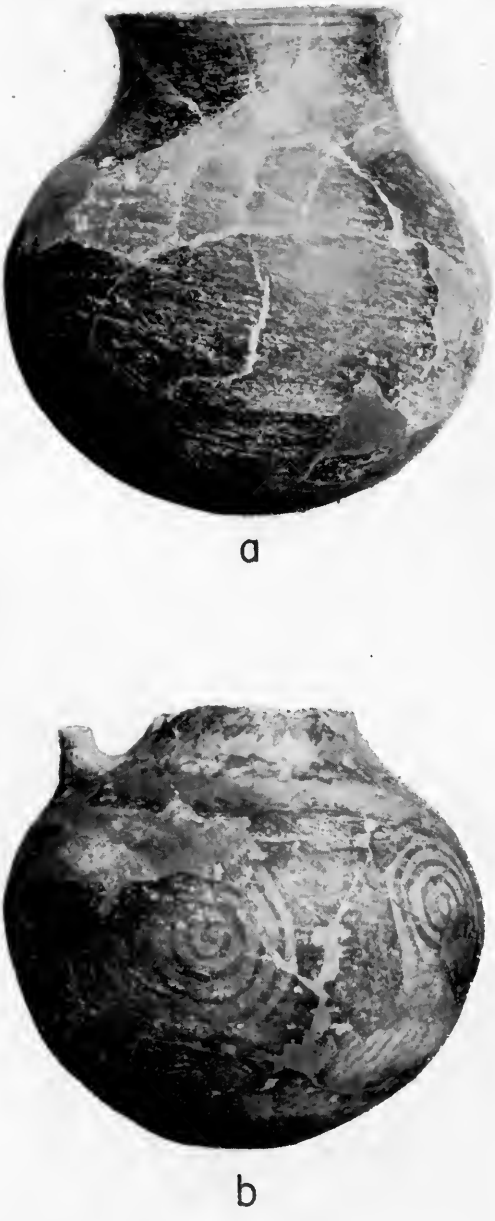


FIG. 76. Jars from Pit-house D, Twin Bridges site: *a*, Alma Plain; *b*, Three Circle Red-on-White. Diameter of *b*, 22.5 cm.

TABLE 7.—SHERD ANALYSIS, SUMMARY OF ALL SITES

	Promontory Site		Turkey Foot Ridge		Twin Bridges		Oak Springs		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
Alma Plain	2,968	72.43	3,212	73.55	767	75.05	232	43.69	7,179	71.65
Alma Rough	220	5.36	32	0.73	14	1.37	7	1.31	273	2.73
San Francisco Red (Saliz variety)	910	22.21	414	9.48	55	5.38	4	0.75	1,383	13.80
Reserve Smudged	.....	.....	134	3.07	16	1.57	155	29.19	305	3.04
Textured	.....	.....	131	3.00	45	4.40	80	15.07	256	2.56
San Lorenzo Red-on-Brown	.....	.....	3	0.07	...	.....	...	.....	3	0.03
Mogollon Red-on-Brown	.....	.....	54	1.23	...	.....	...	.....	54	0.54
Three Circle Red-on-White	.....	.....	154	3.53	46	4.50	...	.....	200	2.00
Mimbres Bold Face Black-on-White	.....	.....	155	3.55	79	7.73	1	0.19	235	2.35
Mimbres Classic Black-on-White	.....	.....	8	0.18	...	.....	...	.....	8	0.08
Reserve Black-on-White	.....	.....	2	0.05	...	.....	17	3.20	19	0.19
Smudged Decorated	.....	.....	.....	.....	...	.....	35	6.60	35	0.35
Indeterminate Black-on-White	.....	.....	68	1.56	...	.....	...	.....	68	0.68
Total	4,098	100.00	4,367	100.00	1,022	100.00	531	100.00	10,018	100.00

IX. REPORT ON BURIALS

Three burials were uncovered during the season of 1947. All were found in Room B of Oak Springs Pueblo; and all, accordingly, have been placed in the Reserve phase. All the bones were in a fair state of preservation and in much better condition than those from the SU site. Analysis of these skeletons has not yet been made.

The following is an outline of the features of each burial:

Burial 1:
- Location: on floor of Room B, Oak Springs Pueblo.
- Age: young (8–15 years).
- Deformation: occipital.
- Position: tightly flexed, on back.
- Associated Objects: none.
- Sex: male(?).
- Orientation: head toward east.
- Phase: Reserve.

Burial 2:
- Location: on floor of Room B, Oak Springs Pueblo.
- Age: middle-aged (45+ years).
- Deformation: occipital.
- Position: flexed, on back.
- Associated Objects: Reserve Smudged bowl, on left shoulder.
- Sex: female.
- Orientation: head toward east.
- Phase: Reserve.

Burial 3 (Fig. 77):
- Location: Room B, Oak Springs Pueblo.
- Age: middle-aged (45+ years).
- Deformation: occipital.
- Position: flexed, on back.
- Associated Objects: none.
- Sex: male.
- Orientation: head toward east.
- Phase: Reserve.

FIG. 77. Burial 3 *in situ*, Room B, Oak Springs Pueblo; arrow (30 cm. long) points north.

X. SYNTHESIS

SUMMARY

During the season of 1947, an archaeological survey and several excavations were undertaken.

Survey

The purposes of the survey were:

(1) To ascertain whether in the Pine Lawn Valley there was any cultural horizon earlier than the Pine Lawn phase (the SU site).

(2) To search for sites occupied by people who did not have knowledge of pottery.

(3) To find out if any Cochise horizon existed in the Pine Lawn Valley.

(4) To find pottery-bearing sites, which when classified would give us a basis on which a complete typological sequence could be set up for the Pine Lawn Valley.

The results of the survey were more than satisfactory. A non-pottery horizon yielding stone tools similar to those from the Chiricahua stage of the Cochise culture was found by Sayles and Rinaldo. This Chiricahua horizon and the tools therefrom are described elsewhere in this report.

In addition, 67 pottery-bearing sites were located, tabulated, and classified as being representative of the Pine Lawn, the Three Circle, the Reserve, and the Tularosa phases. It is interesting to note that no sites of the Georgetown or San Francisco phases were located on the survey; nor indeed were any Mogollon Red-on-Brown sherds found on the surface.

Excavations

Four sites were excavated: (1) Promontory site (Pine Lawn phase); (2) Twin Bridges and (3) Turkey Foot Ridge sites (Three Circle phase); and (4) Oak Springs Pueblo (Reserve phase).

A total of 10,018 sherds and 487 bone and stone artifacts was recovered.

The pit-houses of the Pine Lawn phase were roundish and were not equipped with firepits; those of the Three Circle phase were round or rectangular and, with the exception of one, were provided with firepits.

The Reserve phase dwelling was a group of seven contiguous rooms, built pueblo style, one story high, with masonry walls. The floors of the rooms were depressed slightly below the old ground-level. No firepits were found in these rooms.

The stone implements from the houses of the Pine Lawn phase appear to be representative of a stable stone-industry tradition extending back to early Cochise horizons, but some of the typical tools of the San Pedro stage are lacking.

Some of the stone tools from the houses of the later phases (Three Circle and Reserve) show a clear relationship to the Cochise industry, but most of them show a development from Pine Lawn type and a few are similar to those of the Anasazi culture.

As a result of the 1947 expedition, we believe that the history of the Pine Lawn Valley may be briefly summarized as follows (Fig. 78):

About 6,000 years ago, during a dry cycle, some Cochise people who used tools that are classed as Chiricahua moved into Pine Lawn Valley and camped along a stream (see chap. IV).

These people apparently stayed in the valley and later (during the early centuries of the present era) borrowed pottery from an unknown source. Further, they built and lived in pit-houses. The Chiricahua type of stone tools persisted through to A.D. 500 or slightly beyond. The name Pine Lawn phase has been assigned to the era in which Cochise-type tools of stone, plain pottery, and pit-houses occurred.

There are gaps in our knowledge, but apparently some of the Pine Lawn phase elements persisted, some changed, and a few new items were borrowed from other tribes, resulting in a different assemblage of culture traits. We have identified the period yielding square or round pit-houses, plain and painted Red-on-White and Black-on-White pottery, and stone and bone tools different from those of the preceding centuries, as the Three Circle phase.

Shortly after the last-named phase, we find some new elements that appear in our area. This period of contiguous, multiroomed pueblos with stone walls; of plain, textured and painted pottery (some of the latter being a different kind of painted pottery); and of

stone and bone tools slightly different from the preceding periods, is called the Reserve phase.

In the next section tentative dates will be given these phases.

A few bits of corn have been found in houses of the Pine Lawn phase; none, in houses of the other sites we excavated.

Possibly agriculture was not very important in the area at any time (see pp. 38–42, climatic factors).

INFERENCES

In the chapter on pottery, we mentioned (p. 198) that by means of the graph (Fig. 71) we had established a sequence of houses at the SU site and that certain other features such as architectural details and stone tools corroborated this chronological house sequence. These statements will now be amplified.

After placing the houses of the various excavated sites in relative chronological order by means of the pottery seriation (Fig. 71) it occurred to us that this sequence of houses might be divided into several groups. We decided to manipulate only the data from the Pine Lawn phase, because the sample was large.

The "natural" order of the houses or the character of the trends of popularity of Alma Rough and San Francisco Red, as manifested in houses S, J, U, H and in F, P, 2, Z, strongly suggested that such sub-phase chronological groupings were actually real and could be read from the pottery graph (Fig. 71).

The next step in this investigation was to see whether these units composing the smaller groups of houses (as indicated by the pottery popularities) shared preferences for specific house features, types of artifacts, and pottery types.

To determine if any correlations existed between house features, such as shape, composition of floor and walls and the like, and types of stone artifacts such as angular pestles, multifaced pestles and the like, and the pottery trends, tabulations of the distribution of house features and artifact types were made (see Tables 3 and 8). In working out this tabulation, thirty-one architectural features and twenty-one specific types of artifacts were used.

It was gratifying to find that a number of the architectural categories indicated significant groupings of houses all sharing the same features; for example, the houses of one group had no lateral entryways, while those of another had mostly short ones. This is true even though the houses of both groups do not all show, for

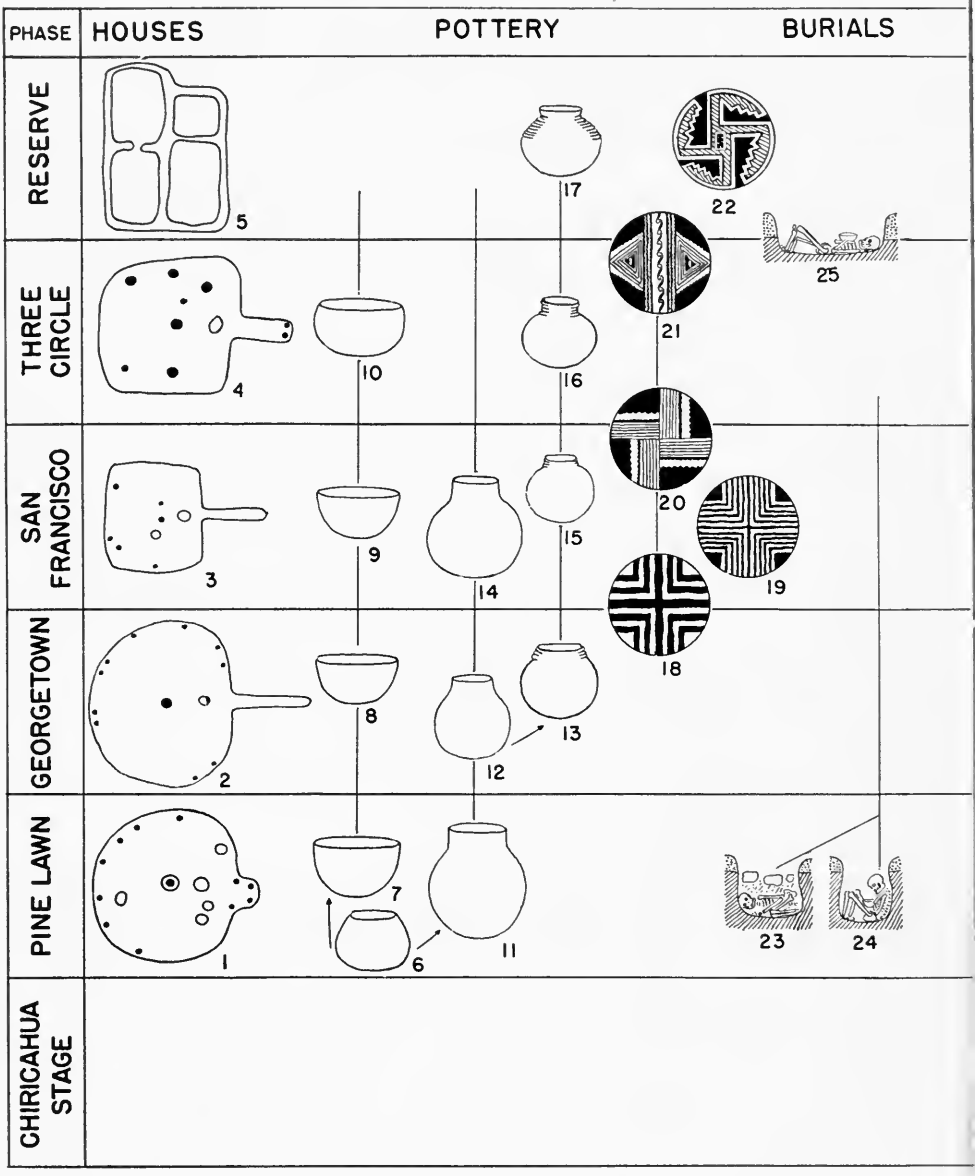


FIG. 78. Chart showing the development of traits in the Mimbres branch (see explanation, pp. 212–213).

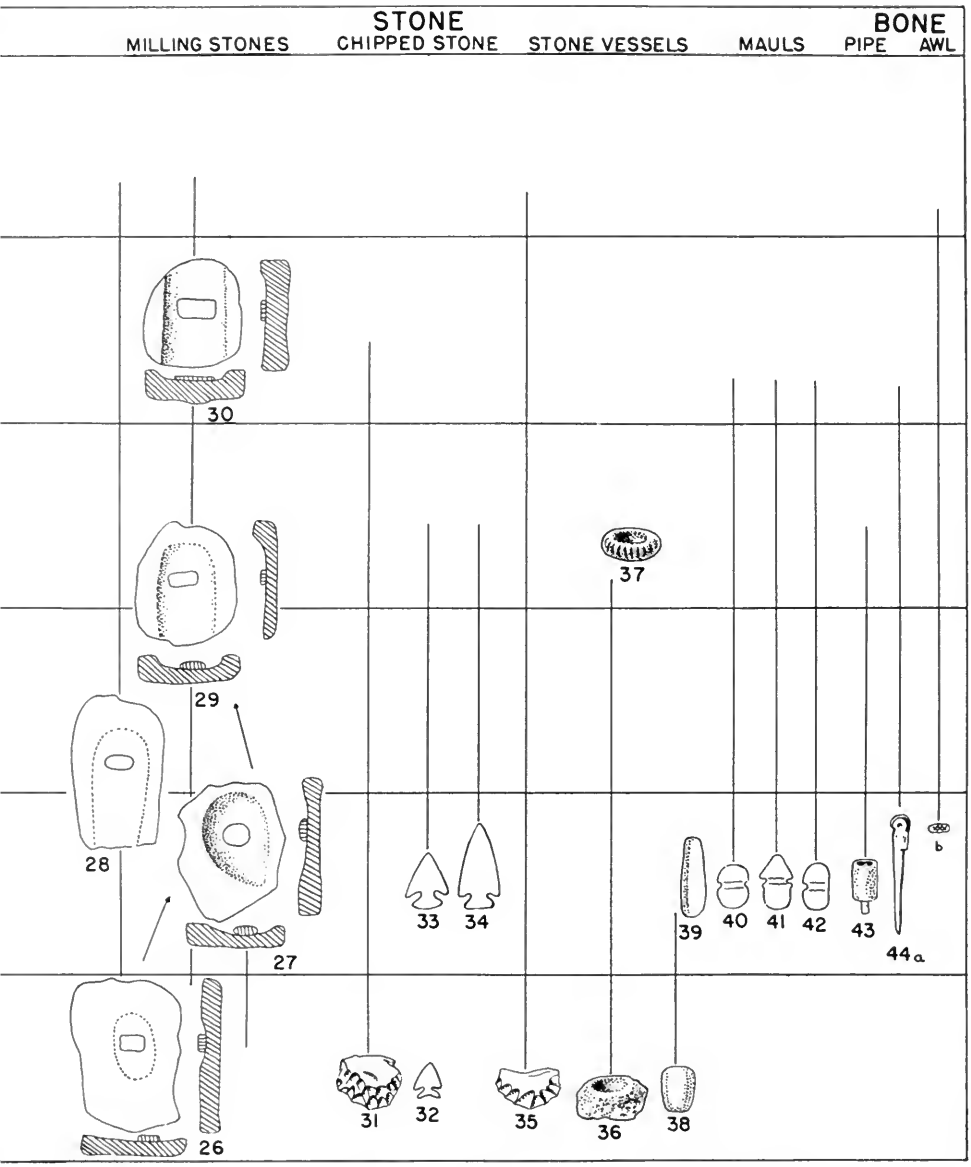


FIG. 78. Chart showing the development of traits in the Mimbres branch—*continued.*

EXPLANATION OF FIGURE 78

1. Pit-house J, plan, SU site (Martin, P. S., 1943, Map 17, p. 154).
2. Pit-house 8, plan, Harris site (Haury, E. W., 1936a, Fig. 19, p. 56).
3. Pit-house 4, plan, Mogollon village (Haury, E. W., 1936a, Fig. 3, p. 11).
4. Pit-house A, plan, Turkey Foot Ridge site.
5. Oak Springs Pueblo, plan.
6. Alma Rough globular jar, Pit-house B, SU site (Martin, P. S. and Rinaldo, J. B., 1947, Fig. 127B, p. 366).
7. San Francisco Red (Saliz variety) bowl, Pit-house F, SU site (Martin, P. S. and Rinaldo, J. B., 1947, Fig. 128I, p. 367).
8. San Francisco Red bowl, Mogollon village (Haury, E. W., 1936b, Fig. 7 [No. 3], p. 30).
9. San Francisco Red bowl, Mogollon village (Haury, E. W., 1936b, Fig. 7 [No. 8], p. 30).
10. San Francisco Red bowl, Harris site (Haury, E. W., 1936b, Fig. 7 [No. 15], p. 30).
11. Alma Plain jar, Pit-house B, SU site (Martin, P. S. and Rinaldo, J. B., 1947, Fig. 127e, p. 366).
12. Alma Plain jar, Harris site (Haury, E. W., 1936b, Fig. 8 [No. 3], p. 32).
13. Alma Neck Banded jar, Harris site (Haury, E. W., 1936b, Fig. 8 [No. 7], p. 32).
14. Alma Plain jar, Harris site (Haury, E. W., 1936b, Fig. 8 [No. 10], p. 32).
15. Alma Neck Banded jar, Harris site (Haury, E. W., 1936b, Fig. 8 [No. 15], p. 32).
16. Alma Neck Banded jar, Pit-house B, Turkey Foot Ridge site.
17. Mimbres Neck Corrugated jar, Swarts ruin (Cosgrove, H. S. and C. B., 1932, Plate 80d [Haury, E. W., 1936b, Fig. 8, No. 26], p. 32; Room B, Oak Springs Pueblo).
18. San Lorenzo Red-on-Brown design, Harris site (Haury, E. W., 1936b, Fig. 6, No. 8, p. 26).

19, 20. Mogollon Red-on-Brown design, Harris site (Haury, E. W., 1936b, Fig. 6, Nos. 9–10 [Pit-house B, Turkey Foot Ridge site], p. 26).

21. Three Circle Red-on-White design, Harris site (Haury, E. W., 1936b, Fig. 6, No. 11 [Turkey Foot Ridge, SU, Twin Bridges sites], p. 26).
22. Reserve Black-on-White, Reserve 1:9 (Haury, E. W., 1936b, Fig. 6, No. 5, p. 26).

EXPLANATION OF FIGURE 78—*continued*

23. Flexed burial in pit beneath stones, Pit-house S, SU site (Sayles, E. B., 1945, Fig. 33, p. 63).

24. Flexed burial in pit, Pit-house C, SU site (Sayles, E. B., 1945, Fig. 33, p. 63).

25. Semi-flexed burial in shallow pit, Pit-house X, SU site (Sayles, E. B., 1945, Fig. 33, p. 63; Room B, Oak Springs Pueblo).

26. Slab or shallow basin metate and mano, Wet Leggett site (Martin, P. S. and Rinaldo, J. B., 1947, Fig. 110, p. 331).

27. Basin type metate and disk mano, SU site (Martin, P. S., 1943, Fig. 62, p. 189; Martin, P. S. and Rinaldo, J. B., 1947, Fig. 106, p. 325, Fig. 110, p. 331.)

28. Slab type metate and oval mano, Pit-house T, SU site (Martin, P. S. and Rinaldo, J. B., 1947, Fig. 109, p. 330, Fig. 110, p. 331).

29. Trough type metate, open one end only, and turtleback mano (Martin, P. S., 1940, Fig. 18; 1943, Fig. 63; Martin, P. S. and Rinaldo, J. B., 1947, Fig. 109, p. 330, Fig. 110, p. 331).

30. Trough type metate, trough open both ends, Pit-house W, SU site (Martin, P. S. and Rinaldo, J. B., 1947, Fig. 108, p. 329, Fig. 110, p. 331).

31. Chopper, Wet Leggett site (Martin, P. S., 1943, Fig. 79, p. 217).

32. Projectile point, Wet Leggett site.

33. Projectile point, Pit-house L, SU site (Martin, P. S., 1943, Fig. 72, p. 207; Haury, E. W., 1936a, Pl. XVII, p. 42).

34. Projectile point, SU site (Martin, P. S., 1940, Fig. 29, p. 65).

35. Scraper, Wet Leggett site.

36. Mortar, Chiricahua 3:16 (Sayles, E. B. and Antevs, E., 1941, Pl. IXl, p. 20c; Martin, P. S. and Rinaldo, J. B., 1947, Fig. 112, p. 335).

37. Stone vessel, Mogollon Village (Haury, E. W., 1936a, Pl. XVf, p. 38).

38. Multifaced pestle, Chiricahua 3:16 (Sayles, E. B. and Antevs, E., 1941, Pl. IXh, p. 20c; Martin, P. S., 1943, Fig. 67B, p. 197).

39. Long, angular pestle, SU site (Martin, P. S., 1943, Fig. 67A, p. 197).

40. Spheroidal, full grooved maul, SU site (Martin, P. S., 1940, Fig. 25, p. 57).

41. Elongated, full grooved maul, SU site (Martin, P. S., 1940, Fig. 25, p. 57).

42. Three-quarter grooved maul, SU site (Martin, P. S., 1940, Fig. 25, p. 57).

43. Tubular pipe with bone stem, SU site (Martin, P. S., 1943, Fig. 71, p. 205).

44. Notched awl and die (Martin, P. S., 1940, Fig. 31, p. 69 [dice]; 1943, Fig. 84, p. 227 [awls]).

example, the same floor plan or arrangement of other interior features.

The tabulation of specific types of stone tools revealed that some artifact types were common to clusters of three or more houses, whereas other artifact types did not conform to this pattern and had only a sporadic distribution throughout the village. Out of the eighty-five different categories of stone and bone tools, twenty-one occurred in significant groupings (Table 3 is condensed; not all 85 categories are contained therein). In these twenty-one categories, some of the clusters or groupings recurred as many as eight or nine times; for example, basin metates, angular pestles, multifaced pestles, stone dishes, full grooved mauls and random flake scrapers were found in houses Q, F, P, 2, Z. This same assemblage of traits does not occur in any other group of houses. Therefore, since groupings of specific artifact types, architectural features, and pottery preferences usually occurred together, it seemed highly probable that we had perhaps discovered something that was more than a fortuitous grouping.

Although we could distinguish five house groups in the pottery chart, when we tried to correlate house features, pottery types, and artifact types, it was difficult to abstract this number of clear-cut groupings. A possible explanation of this difficulty is that the rates of change in ceramics, house types, and artifact types were different. In any event, it seemed best to try an arrangement containing the SU houses in three groups rather than in the original five. This fortuitous division proved satisfactory, for it gave us clusters of traits in house features, pottery types and artifact types which are distinct and easily observable, and which have, we believe, historical significance.

Our groupings are Early Group, Middle Group, and Late Group (see Table 8). Each of these groupings shows distinctive characteristics in architecture, pottery preferences, and types of artifacts.

The five houses of the Promontory site are not included in these groupings. According to pottery preferences, the Promontory houses have been placed at the end of the Pine Lawn phase. When, however, we consider architectural features and associated tools, we are unable to fit these houses in either the Early, Middle, or Late Group. We do not know why this is so. It may be because of the fact that out of a probable eighteen houses at this site, only four were completely excavated and one was trenched. In other words, our sample may be inadequate.

CHARACTERISTIC HOUSE FEATURES OF THE EARLY GROUP
(Houses A, 1, R, S, J, U, H)

Floors.—Clay or clay-gravel.
Lateral Entrance.—Short.
Pits.—Few (one to three).
Grooves in Floor.—Present.
Postholes.—One central and several peripheral postholes to each house.

CHARACTERISTIC HOUSE FEATURES OF THE MIDDLE GROUP
(Houses Q, F, P, 2, Z, G, L, T, I)

Floors.—Clay and gravel.
Lateral Entrance.—Absent.
Pits.—Four to six.
Grooves in Floor.—Absent.
Postholes.—A few peripheral.
Burned Houses.—More frequent than in other two groups.

CHARACTERISTIC HOUSE FEATURES OF THE LATE GROUP
(Houses D, O, B, M, C, E, N)

Floors.—Smoothed clay.
Lateral Entrance.—Long (2 meters or more).
Pits.—Many (seven to nine).
Grooves in Floor.—Absent.
Postholes.—Many peripheral; no central.
Burials.—More per house.

Pottery Trends.—Alma Rough declines from a high of 68.5 per cent in the early part of the Pine Lawn phase to 0.4 per cent in the latest part.

Alma Plain starts at a low of 10.5 per cent in the early group and reaches a high of about 75 per cent in the last part of the phase.

San Francisco Red fluctuates in percentage and shows no significant variations that we can interpret.

Artifact Trends (see Table 3).—The following tools *decrease* in frequency from the earliest part of the Pine Lawn phase to the latest:

(1) Oval manos.
(2) Basin metates.
(3) Troughed metates, open at one end.
(4) Mortars and pestles.

The following tools *increase* in frequency from the earliest part of the phase to the latest:

(1) Oblong manos.
(2) Rubbing stones.
(3) Slab metates.
(4) Projectile points.
(5) Polishing stones (Note: As Alma Rough went out of style and Alma Plain became more popular, more polishing stones were needed, since Alma Plain is a polished ware.)
(6) Random flake scrapers.
(7) Knives.
(8) Bone awls.

TABLE 8.—DISTRIBUTION OF HOUSE FEATURES AT SU SITE

	EARLY							MIDDLE									LATE						
	A	1	R	S	J	U	H	Q	F	P	2	Z	G	L	T	I	D	O	B	M	C	E	N
Shape																							
Roundish	..	×	..	..	..	×	..	..	×	..	..	×	..	..	..	..	..	×	×	×	..	×	×
Circular	..	..	×	..	×	..	×	×	..	..	..	..	..	..	×	..	..	..	..	..	..	..	..
Ovoid	..	..	..	×	..	..	..	..	..	×	..	..	..	..	..	..	..	..	..	..	×	..	..
Irregular	..	..	..	..	..	..	..	..	..	..	×	..	×	×	..	×	×	..	..	..	..	..	..
Kidney	×	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Walls																							
Clay	×	×	×	×	×	..	×	×	×	×	..	..	..	×	×	×	×	×	..	×	..	..	×
Clay and gravel	..	..	..	..	..	×	..	..	..	..	..	×	×	..	..	..	..	..	×	..	×	×	..
Wattle and daub	..	..	..	..	..	..	..	..	..	..	×	..	..	..	..	..	..	..	..	..	..	..	..
Depth																							
0–35 cm	..	×	..	..	..	..	..	..	..	..	×	..	..	..	..	..	..	..	..	..	..	..	..
35–50 cm	..	..	..	×	..	..	..	..	×	..	..	..	×	..	..	..	×	..	×	..	×	..	..
50–65 cm	..	..	×	..	..	×	..	×	..	..	..	..	..	..	×	..	..	..	..	..	..	..	..
65–120 cm	×	..	..	..	×	..	×	..	..	×	..	×	..	×	..	×	..	×	..	×	..	×	×
Floor																							
Clay	×	..	..	×	×	..	..	..	..	..	..	..	×	..	×	×	×	..	×	×	..	×	×
Clay and gravel	..	×	×	..	..	×	..	..	×	..	×	×	..	×	..	..	..	..	..	..	×	..	..
Clay, gravel, hardpan	..	..	..	..	..	..	×	×	..	×	..	..	..	..	..	..	..	×	..	..	..	..	..
Firepit	×	×	..	..	..	..	..	..	×	..	..	..	..	..	..	..	..	..	×	..	..	×	..

TABLE 8.—DISTRIBUTION OF HOUSE FEATURES AT SU SITE—*continued*

	EARLY							MIDDLE									LATE						
	A	1	R	S	J	U	H	Q	F	P	2	Z	G	L	T	I	D	O	B	M	C	E	N
Lateral entryway																							
Short (50–90 cm.)	×	..	×	..	×	..	×	×	..	..	..	..	..	..	..	..	×	..	..	..	..	..	×
Medium (90 cm.–2 meters)	..	..	..	..	..	×	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Long (2–5 meters)	..	..	..	..	..	..	..	..	×	×	..	..	..	..	..	..	..	..	×	..	×	×	..
None	..	×	..	×	..	..	..	..	..	..	×	×	×	×	×	×	..	×	..	×	..	..	..
Pits																							
1–3	×	×	×	×	..	..	×	..	..	..	..	..	..	..	×	..	×	..	..	..	..	..	..
4–6	..	..	..	..	×	×	..	×	×	..	×	×	..	..	..	..	..	..	×	×	..	..	..
7–9	..	..	..	..	..	..	..	..	..	×	..	..	×	..	..	×	..	×	..	..	×	×	×
Grooves	×	..	×	×	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Roof																							
Central and peripheral posts	×	..	×	×	×	..	×	×	×	..	..	..	..	..	×	..	..	..	..	..	..	..	..
Many peripheral posts (no central post)	..	×	..	..	..	..	..	..	..	×	×	..	×	..	..	×	..	×	..	×	×	×	×
Few peripheral posts (no central post)	..	..	..	..	..	×	..	..	..	..	..	×	..	..	..	..	×	..	×	..	..	..	..
No posts	..	..	..	..	..	..	..	..	..	..	..	..	..	×	..	..	..	..	..	..	..	..	..
Burials	..	..	..	×	..	..	..	×	..	..	×	..	..	×	..	×	×	..	×	×	×	..	..
Burned houses	..	×	..	..	..	×	..	×	×	×	..	×	×	..	×	×	×	..	..	..	..	..	×

After placing the SU houses in these three groupings, we scanned the map of the site to see if the houses of each group bore any geographical or spatial relationship one to the other. We were unable to observe any such relationship.

Do these three groups—Early, Middle, Late—point to sub-phases of the Pine Lawn phase? Since they are of a temporal nature as set up, they probably do represent sub-phases. We have, however, refrained from making any division of this sort beyond the informal groupings we have suggested. If we had at our command more data, and especially tree-ring dates, we should be in a better position to create such sub-phases.

We don't know the life span of any of these three groups. We can only guess that it was fairly short, perhaps fifty years.

It still seems clear to us that the SU site is older than the Promontory site.

Arranging pottery data in a graphic form such as we have borrowed and adapted to our needs suggested other theoretical ways in which this method might be used.

This method of manipulating ceramic data enables one to refine the history of the rise and fall of pottery types in any given cultural grouping and within phases. It also enables one to note interrelationships of cultural development, the influences that came in, the extent to which they took hold, and the ways in which they influenced the main stream of development. In short, one obtains a better understanding of the history of a given group of ceramic types. It permits one to observe sharp breaks or slow, steady evolution in that history. This graphic method of presentation does not tell one everything, but it does enable one to make other correlations and comparisons. Our chart lacks many things, but it yields a few examples of what we mean.

Alma Plain was a very stable type—much more so than any painted ware—having a span of life at least 500 years in length. During that time several other wares came in and faded out again. While the color of the paste of Alma Plain remained more or less unaltered, the shapes changed somewhat during its lifetime. Were these changes in shapes brought about by outside influences and did other wares of the area have similar shapes?

Alma Rough had a comparatively short life and when it died out it was immediately replaced by textured wares.

A sudden occurrence of a new type or a rise in the popularity of a given type might be correlated with other simultaneous changes

in the culture—changes in architecture or introduction of new tools (for example, the grooved ax)—and all of these might be due to new ideas that have filtered into the area or (most unlikely) an "invasion" or a shift of population.

If enough data were available (and we do not have enough for the Mimbres branch), such a presentation of pottery trends would be a very sensitive time scale and a better indication of change than the conventional treatment by phases. It presents, moreover, a realistic continuum that can not be obtained by thinking merely in terms of phases. These at best represent only high points or unconnected unit-blocks in a culture and do not give the student a feeling of continuity. On the other hand, if a sharp gap exists in the graph, one can quickly ascertain whether this is due to lack of enough digging in an area or whether some historical process or event had taken place. This event, which may represent a change in institutions, a step in human progress, an unrecorded drama, might otherwise go unheeded because our previous tools for measuring and interpreting culture change have been too gross.

Since we do not have enough tree-ring dates for the Mimbres branch, this graphic method constitutes a more refined time scale than anything previously at our disposal. By means of this method it is now possible to take a single house, a single room, a refuse heap, or a site, and place it on this relative time scale.

Can we correlate other changes in culture with changes in pottery trends? It is fair to assume that in the near future we shall have more dates for the Mimbres branch of the Mogollon culture. These dates may be derived from dendrochronology, from the newer C14 method, or from other possible physico-chemical methods, if these latter methods are perfected. When more dates have become available, we can set the scale of pottery changes against the framework of absolute chronology to see whether the rates of changes in pottery types have been constant through given periods. If we can note significant pottery differences, we may then ascertain how and at what rates houses, tools and other aspects of material culture have changed.

Summary

This graphic method of presentation is an approach which (1) is a refined archaeological sequence of pottery trends that may be useful in the absence of absolute dates; (2) enables one to assess the amount of cultural change as reflected in pottery in a given period

of time; (3) permits one to suspect or discern gaps in the data and in the evolutionary sequence with a consequent deeper understanding of apparent gaps. These gaps may turn out to be true gaps in sequence, which can be filled in by excavating more sites, or they may represent periods of rapid change.

If the data for trends in types of pottery are complete enough, one might be able to understand the history of the occupation of any village site—for example, the type and interior features of the houses and the number of houses that were occupied at any given time. This understanding may turn out to be a substitute for absolute chronologies and almost as satisfactory as if tree-ring dates were available for each house. Even if we had tree-ring dates for every house—an unlikely possibility!—this graphic mode of showing pottery trends would be more than useful because it gives a more complete picture of the occurrences in a particular area or site at a given time.

An understanding of the history of the Southwest is now at a point where refinements relating to cultural change are in order.

In collecting the raw data for the section on pottery trends, we were appalled at the lack of raw data in published reports. Many authors omit sherd counts entirely; others merely give samples from a site; others publish only percentages from which one cannot judge the total number of sherds that were tabulated; still others present tables labeled "Distribution of Pottery Types" and in columns below give numbers, but whether these numbers are actual sherd counts, percentages, or numbers of whole vessels, one cannot tell. It is even difficult to obtain sherd counts from the archaeologist himself, since his notes are often hopelessly buried. And why should one have to write a dozen letters to obtain these data that may be important for future studies?

This, then, is a plea for the publication of complete sherd counts by houses, by levels (if any were noted), by type, and in any other way that might be useful to a student in the future. The work involved in preparing such tables is not great, since presumably one makes some sort of tabulation in order to draw conclusions pertaining to stratigraphy and changes in pottery styles. Bury such tables at the rear of the report, in an appendix if you will, but publish them by all means. It is a pity that such complete and explicit tabulations of pottery counts are so rare in published literature on the Southwest. Two outstanding exceptions to this statement are the publication of Kidder (1931), and that of Beals, Brainerd and Smith (1945).

Tools of stone and bone are likewise usually too scantily tabulated. Some archaeologists list all the tools by sites, but not by houses or levels, if the latter existed. It would be most helpful in correlating trends in pottery, architecture, and tools to have the data listed in the most explicit manner. If this is done, a student may take any archaeological report and rework the data by techniques that may develop in the future.

RESULTS

The survey and excavations carried out during our 1947 season accomplished the following results which we believe to be significant:

(1) A more complete definition of the Pine Lawn phase through an analysis of trends in popularity of house features, pottery types, and stone artifact types, as well as the extension of our knowledge of the later part of the phase as represented in the Promontory site.

(2) The discovery in the Pine Lawn Valley of a Cochise site which is identified typologically with the Chiricahua stage and shows relationships both to the Chiricahua stage of southeastern Arizona and the stone artifacts of the Pine Lawn phase. This discovery consequently led to a hypothesis that the Chiricahua stage developed directly into the Pine Lawn phase, omitting most of the changes found in the San Pedro stage.

(3) The delineation, by means of the surface survey, of the broad outlines of the cultural sequence in the Pine Lawn Valley, including the beginning of a definition of the Tularosa phase, as distinguished from the Reserve (or Upper Gila) phase.

(4) Increase in our knowledge of the Three Circle phase through description of that phase in a time interval between that represented at the Harris Village and that of the Three Circle phase houses at the SU site. This interval was represented in the houses of Turkey Foot Ridge and Twin Bridges sites.

(5) The delineation of the beginning interval of the Reserve phase as represented at Oak Springs Pueblo.

ESTIMATED DATES FOR PINE LAWN VALLEY

No tree-ring dates are yet available for any houses of the Pine Lawn, Georgetown, San Francisco, or Reserve phases in Pine Lawn Valley. It is hoped that some day some of the wood recovered from the valley will be dated, since Dr. A. E. Douglass and his assistants of the Laboratory of Tree-Ring Research, University of Arizona, Tucson, are analyzing it.

In the meantime, we have attempted to work out an *estimated* chronology, which we regard as imperfect but the best that can be made at the present time. In making up this tentative estimate of dates, we relied on all the typological evidence we had secured in four seasons of excavations and on the evidence from the following sources: Gladwin (1945), Haury (1936a and b, 1940, 1942), Haury and Sayles (1947), Nesbitt (1938), and Roberts (1940).

SEQUENCE OF PHASES AND ESTIMATED DATES FOR THE PINE LAWN VALLEY

Reserve	A.D. 1000–?
Three Circle	A.D. 900–1000
San Francisco	A.D. 700– 900
Georgetown	A.D. 500– 700
Pine Lawn	?– 500

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